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ABSTRACT

This document is intended to provide a record of the activities of the conference. Featured in the conference were 11 general sessions, 16 panels and symposia, several invited presentations, multiple workshops, and over 100 contributed presentations. The proceedings contain seven sections, five of which are topically arranged with presentors listed alphabetically. These include presentations pertaining to: (1) environmental/educational philosophy; (2) environmental/educational policy; (3) international, global, and third-world concerns; (4) educational research; and (5) environmental education methodologies. General session addresses, and panels and symposia are contained in the other two sections. These papers are at full length, while all others have been edited to approximately 1,500 words. If an extended abstract was not submitted, the short abstract from the conference program is included to complete the record of the conference. Although the conference was not officially designated as an international one, participants from ten nations outside North America took active roles in various sessions. (TW)

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Conference

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Washington, D. C.

ENVIRONMENTAL EDUCATION: PROGRESS TOWARD A SUSTAINABLE FUTURE

1985

Conference

Selected Papers from the Fourteenth Annual
Conference of the North American
Association for Environmental Education

Edited by

John F. Disinger
John Opie

Published by

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for Environmental Education
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MISSION STATEMENT

The North American Association for Environmental Education (NAEE) is a professional association established to assist and support the work of individuals and groups engaged in environmental education, research, and service. In meeting the goals and needs of environmental professionals, NAEE promotes the analysis and understanding of environmental issues and questions as the basis for effective education, problem-solving, policy-making, and management.

Through its activities, NAEE seeks to foster (1) the education of skilled individuals able to understand environmental problems and possessing the expertise to devise effective solutions to them, and (2) development of a citizenry conscious of the scope and complexity of current and emerging environmental problems and supportive of solutions and policies which are ecologically sound.

NAEE is organized into three interactive sections each conducting specialized programs responsive to their members. These are:

- The Elementary and Secondary Education Section (ESES)
- The Environmental Studies Section (ESS)
- The Non-Formal Section (NFS)

Professionals within these sections address the following audiences:

- the general citizenry;
- the fellow educators at all educational levels;
- those who make or facilitate the making of major decisions affecting the environment (e.g. government officials, scientists, engineers, planners, lawyers, journalists and mass communicators), and
- environmental resources managers (e.g. foresters, water resources managers, wildlife managers, park managers)

NAEE maintains the following guiding principles. Environmental Education should:

- consider the environment in its **totality** — natural and built; biological and physical phenomena and their interrelations with social, economic, political, technological, cultural, historical, moral, and aesthetic aspects;
- **integrate knowledge** from the disciplines across the natural sciences, social sciences, and humanities;
- examine the scope and complexity of environmental problems and thus the need to develop **critical thinking** and **problem-solving** skills and the ability to synthesize data from many fields;
- develop **awareness and understanding of global problems, issues, and interdependence** — helping people to think globally and act locally;
- consider both short and long term **futures** on matters of local, national, regional and international importance;
- relate **environmental knowledge, problem-solving, values, and sensitivity** at every level;
- emphasize the role of **values, morality** and **ethics** in shaping attitudes and actions affecting the environment;
- stress the need for **active citizen participation** in solving environmental problems and preventing new ones;
- enable learners to play a role in **planning their learning experiences** and providing an opportunity for making decisions and accepting their consequences; and
- be a **life-long process** — should begin at a preschool level, continue throughout formal elementary, secondary, and post secondary levels, and utilize non-formal modes for all age and educational levels.

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PREFACE

This is the proceedings volume of the Fourteenth Annual Conference of The North American Association for Environmental Education (NAEE). The conference was held at the National 4-H Center, Chevy Chase, Maryland, from September 27 through October 2, 1985. Featured were eleven general sessions, a number of additional invited presentations, sixteen panels and symposia, multiple workshops, and more than 100 other contributed presentations. The conference was preceded by workshops sponsored and conducted by the Association's three sections--Elementary and Secondary Education, Environmental Studies, and Non-Formal. A number of field sessions were available before, during, and after the conference. Though the conference was not officially designated as an international one, participants from ten nations outside North America took active roles in various sessions.

A number of organizations in addition to NAEE participated both formally and informally in the conference. Among them were the International Society for Environmental Education (ISEE), the Alliance for Environmental Education, the American Society for Environmental History (ASEH), the Canadian Man and Biosphere Network (MAB/NET), the Conservation Education Association (CEA), the American Nature Study Society (ANSS), and others.

The purpose of this volume is to provide as complete a record as possible of the activities of the annual conference. It contains seven sections, five of which are topically arranged with presentors listed alphabetically within the section, General session addresses and panels and symposia are contained in the other two sections. These papers are full length, all others have been edited to approximately 1500 words or less. If an extended abstract was not submitted, the short abstract from the conference program is included to complete the record of the conference.

The editors most gratefully thank all of the conference presentors, particularly those who submitted extended abstracts, and most particularly those who responded positively to our request to shorten them, to make this volume a manageable one. Also deserving commendation is the staff of NAEE's headquarters office at Brukner Nature Center, Troy, Ohio, for its efforts in preparing the edited manuscript for publication, then carrying through in the production of the present volume. This activity necessitated a major increase in demands on Joan Heidelberg and her staff; we are most pleased with the results.

John F. Disinger
John Opie
Co-editors

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I. General Session Presentations

General Session I: September 27, 1985, 7:00 p.m.

Arthur B. Sacks, President 1984-85, North American Association for Environmental Education; Director, Institute for Environmental Studies, University of Wisconsin-Madison.

President's Address: Manicheism Revisited--Environmental Education in the 1980s.

It is the distinct pleasure of presidents of professional societies and associations to welcome participants to annual conferences and conventions. Sometimes, I think it is the only pleasure the president of an organization ever has during his or her term of office--making the pleasure all the more pleasurable. One wishes to savor the moment--the captive audience present at the start of such an event, the audience, attentive--that is, for the most part. If they have had good flights, have arrived on time to nice accommodations, and have had a decent meal, they are polite and positive, looking forward to meeting old friends, colleagues, and teachers, the stimulation that comes from discussing new ideas, debating old paradigms, and discovering new approaches and people. The overheads have not yet blown their bulbs, the "to-be-expected" disagreeable question that almost invariably arises and which is impossible to answer has not yet been posed, the highest of expectations associated with any conference have not yet met with the inescapable realities of the limitations of what a conference can bring. Although none of these disappointments will of course befall the 1985 Conference of the North American Association for Environmental Education, nevertheless, dear colleagues, it is the moment on the edge of a conference that a president savors.

It is also a moment when a president--especially an outgoing president as is the case here--can say with impunity almost anything he or she wishes--to be outlandish, to be provocative, to be statesmanlike, to offer wise pronouncements, to observe what appears to be going on within a field. Aware of such a singular opportunity, only the most restrained and selfless president lets the moment go so that the real business of the conference can proceed. Alas, dear colleagues, I am not such a president, and thus the remarks which follow on the Conference theme: Environmental Education: Progress Toward a Sustainable Future.

First, I wish to observe the intentional or perhaps unintentional ambiguity of our Conference title. The primary meaning--identified by John Disinger in his printed welcome contained in the Conference program which you have--indicates that we are concerned here with the role environmental education has played and must continue to play in educating multiple audiences in such a manner as to sustain the totality of our biosphere--the life support systems that permit humankind and all life to continue on the earth--to continue doing the important, the trivial, the curious, and even the foolish things we do--and to sustain that part of the biosphere that is uniquely human--society, culture, and civilization, which provide the framework for all human action.

In this context of our conference title, you will hear addresses and research reports, and participate in workshops and the like, which speak to many of the underlying causes of the environmental "problematique" that threaten sustainability--population, resource depletion, resource consumption, resource competition, toxic and hazardous timebombs, political instabilities and nuclear bombs that may arise from all this. Perhaps some of this you will have heard before at other NAEE conferences, or at some other environmental conference. The fact that such issues will again be addressed here suggests their depth, their magnitude, and their difficulty.

You will also hear commentary about developments from the community of practitioners from each of the three sections that comprise this organization--those who teach our young in formal public school settings, those who educate the public at large through what we refer to as "non-formal" lines, those who educate future teachers of teachers at all levels of education, and those who attempt to investigate environmental problems and seek scientific and public policy responses to them.

Whether or not environmental education has made progress toward a sustainable future will be for you to judge against whatever criteria you choose. From my perspective, however, there is little doubt that environmental education and environmental studies have already made significant contributions to human welfare, to general public awareness, and to the interdisciplinary understanding of the complex problems that must be fully perceived and comprehended by our global citizenry before such problems can be meaningfully addressed. However, the scope of environmental problems, their size and complexity, the web of interrelationships between and among ideology, belief, values, assumptions, and often conflicting human needs, and the physical and biological phenomena of our biosphere--if better understood than ever before--still possess great mysteries and lacunae. Whatever advances that have been made seem meager when we reflect on what yet has to be understood and done and how little time, relatively, we have left before major environmental systems become unhinged.

The second meaning of the conference title relates to environmental education and a sustainable future for the field itself. In this context, one can picture a question mark at the end of the title. Has the field of environmental education progressed over the past 15 years? Will the field, which has not been overly blessed or endowed with resources from governments, be able to sustain itself in the future? Will an interdisciplinary field which has the mighty disciplines to contend with be able to survive even harder financial times? Will a field, still called a fad by some and unrigorous by many, be able to outlive the bust of a global economy gone sour, of unending deficits, unemployment, and fears that have burst forth after the first boom of social and ecological conscience of the 1960s and 70s? Have we as environmental educators expanded our horizons, improved our approaches, advanced our own knowledge and thinking sufficiently to point the way to a sustainable future for the profession? An examination of your program reveals that these issues will be addressed as well, either directly or indirectly, throughout this conference.

From my perspective, environmental education has indeed matured and has begun to make strides which suggest that a sustainable future is possible for the field. The indications are all around us, and they lie both on the surface and deep within. On the surface, we see a growth in the number and the size of professional environmental education associations such as NAEE. We see developments such as the name change of this organization from National to North American, denoting the recognition that environmental problems are transboundary in nature, that environmental educators who work in intellectual regions broader than those determined by politics have much to contribute to one another. We see signs of effort among professional societies to communicate with each other, to work for common goals. Below the surface, within the field itself, we see far greater concern, awareness, and attention being paid to issues that are international and global in scope. We see governments in the developing world investing significantly in promoting environmental education. We see efforts such as the World Conservation Strategy and activities of organizations such as the International Society for Environmental Education. We see a new awareness by the environmental education community to investigate questions of ecological sustainability, to educate the public on these issues, no longer being content with looking at environmental problems in isolation or as matters of concern to individuals in specific locales alone.

And we also see a change in what I will refer to as the manicheism of the environmental community. Manicheism derives its name from its founder, Manes, who established one of many Christian heretical groups in the first centuries of the first millennium of Christianity. Manicheism as a theological system and a religion became widely accepted between the 3rd and 5th centuries A.D. Its central doctrine, making it a heresy to the Church, was that Satan was co-eternal, with God: the world was caught in a struggle of good and evil, two clearly defined modalities, neither of which could be erased by the other.

What does this have to do with environmental education? For a long time, the environmental community has tended to think of itself as the power of good, and the business, industrial, and governmental segments of society engaged in the development of the world's resources as the power of evil, existing co-eternally in a struggle which has the biosphere as its battleground. On the one side, this has led some environmentalists to view the other side as hedonistic, short-sighted rapists of Mother Earth. On the other, this has led developers to view environmentalists as dim-witted preservationists, denying human progress and potential that could advance the quality of life for the many as well as the few. Although there is some truth in both stereotypes, like all stereotypes they are distortions, caricatures. Increasingly today, the environmental education community has recognized the inherent partnership that exists between conservation/preservation and sound development which does and will continue in both the developing and developed worlds. Increasingly, this has led to a greater responsibility felt within the environmental community to communicate with, and direct effort towards, development of cooperative relationships with those sectors of society which are devoted to development. This does not mean that segments of the environmental community now have been perverted by the forces of evil. It does mean that as environmental educators we have realized the limitations of preaching to the already converted, and the importance of using our not inconsiderable powers as teachers to transfer the best information to the decisionmaking community so that we do not bring down the sins of our fathers onto our children.

In the main, however, environmentalists, like Manichean heretics, have been a minority voice within dominant religion, if you will. This voice has grown stronger over recent years, but it has become seriously fragmented, as diverse groups of like-minded heretics have splintered to form numerous sects. Each environmental education sect has sought resources from the same relatively small group of givers; each has maintained discrete organizations, competing for the same clientele as members; each has let relatively minor "theological" differences prevent optimal cooperation. The result has been mis-communication or non-communication among groups, scattered effort, and energy wasted.

Commenting in 1811 on his frustration with non-heretical religious groups within the established Church in England, the British poet Lord Byron wrote to F. Hodgson, saying: "I would sooner be a Paulician, Manichaean, Spinozist, Gentile, Pyrrhonian, Zoroastrian, than any one of the 72 villainous sects who are tearing each other to pieces for the love of the Lord."

Well, environmental education groups are not as bad as those 72 sects, nor are we as numerous. But if we are to make progress as a field, if we are to optimize environmental education's affect to advance humankind toward a sustainable future, we must find new and better ways to cooperate among ourselves as well as with our brethren and sisters within the decisionmaking community.

Whether environmental education has progressed sufficiently to do so is a question that lies before us. Hopefully, this Conference will move us further down the path that we must take.

General Session II: September 28, 1985, 7:00 p.m.

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The Emergent Environment and the Problem of Cosmic Purpose.

It is no secret that our actions and attitudes are shaped by our general outlooks, our metaphysics, philosophies, myths, and religions. The area of environmental education must include at some point an examination of the general visions of the world that have either promoted or tolerated environmental abuse. And it cannot be indifferent to the search for a cosmology that would foster in us an appropriate reverence of nature that at the same time would be scientifically realistic.

My topic, therefore, is cosmology. What general vision of the universe must we have if our concern for nature is to be genuine, enduring, and realistic without being sentimental? Is such a cosmology available? Can we ignore or postpone indefinitely a consideration of the large question of cosmic purpose if we are truly interested in our environment? And if we are concerned about environmental education for the future, can we afford to suppress the question of the ultimate future of our universe? Can we, especially if our concern is the future of our environment, comfortably turn away from the issue of cosmic teleology?

The question whether our emergent, evolving universe is in any sense purposeful is one that we are inclined to ignore because it seems that we are too small for it or are not in a position to answer it in any case. And so when the question of purpose in the universe comes up, we often feel uneasy. It is a topic for Gary Larson or Woody Allen (who once said that he perceived intelligence in the universe except for certain parts of New Jersey), but not for sensible, sober, feet-on-the-ground people like ourselves. We might (with the humanist) deem it sufficient simply to direct our energies toward improving the immediate environment, and we may see no connection between our practical ecological activity and the "remote" question of any possible "ultimate" environment. And yet, it should make all the difference in the would to an environmentalist whether this tiny planet for which we care so dearly is itself embedded in the context of a meaningful or an indifferent universe.

Is the care that we feel for our planet a stirring which has the backing of the universe itself, or is it only the isolated pangs of a few lonely human subjects stranded in a cosmic desert? Is the world for which we are so concerned fundamentally indifferent to our concern, or is our environmental concern perhaps the sounding forth of a refrain that has its roots in the evolutionary universe with which our own existence is continuous? Do we inhabit an unconscious universe in which our conscious concern is only an accidental evolutionary anomaly? Is our conscious environmental concern simply one more product of the impersonal workings of natural selection, the expression of "selfish genes" seeking only the goal of self-perpetuation? Or is our concern itself the manifestation at the human level of cosmic evolution of some transcending care that is deeply intrinsic to the evolutionary universe itself?

Many influential thinkers in the modern world are convinced that the weight of science is clearly on the side of cosmic pessimism. Such thinkers consider any vision of purpose in the universe to be archaic and illusory. They see cosmic teleology as no more than the mere psychological projection of our longings for significance onto a universe which, as it moves entropically toward thermodynamic equilibrium, will expose all life and consciousness as insignificant in the long run. They consider any alternative to this view to be academically unacceptable. And they often point out that religious attitudes, not secular ones, are largely responsible for our environmental problems.

A great deal has recently been said and written about the role of religion in bringing about our environmental crises. It is not my purpose to dredge this issue up here, nor to engage in controversy over Lynn White´s thesis on the biblical and Christian origins of the present ecological situation.[1] I think there may well be something to his position that Christianity´s eschatological outlook has set loose a drive toward "progress" and development that has influenced the cultural climate in which environmental abuse has taken place. And I would add to White´s thesis an even more obvious suggestion as to how Western religion may have allowed an attitude congenial to the neglect of our immediate environment. It seems clear to me that an excessively other-worldly religiosity does indeed have negative implications for the shaping of an environmental ethic. Dualism and what Paul Tillich calls *supranaturalism* in Christian history have allowed religious consciousness in the West to ignore this world for the sake of the next. And an exaggerated apocalypticism has often established such a sharp discontinuity between this "miserably hopeless" temporal world and the eternal next one that our natural surroundings appear insignificant and hardly worth preserving. The Platonic doctrine that terrestrial things are mere shadows of their Eternal Types may tacitly permit an unnecessarily disparaging attitude toward things "here below". There is no question in my mind that certain kinds of religious attitudes do indeed foster an ecological disinterest and even destructiveness. And our religious traditions need to undergo a thorough examination of conscience on this matter--something that they have not yet begun to do on a large scale.

However, instead of focusing on the religious origins of our environmental problems on this occasion, I would prefer instead to discuss the implications of the specifically non-religious philosophy of cosmic pessimism for shaping our attitudes toward the environment and its future. *Can a healthy environmental vision tolerate the expectation (whether implicit or explicit) that the final destiny of our physical universe is the void of meaninglessness*? Can we even theoretically allow for the plausibility of cosmic pessimism without thereby endorsing a cosmology that would eventually suffocate an environmentalist spirit?

I am speaking here of the predominantly, but by no means wholly, modern view that we live in a universe that lacks any ultimate purpose, that has no transcendent origin and no divine destiny, that our universe, the earth, and the biosphere are no more than the result of blind chance and impersonal necessity. This is a view that silently underlies numerous presentations of the scientific view of nature. It is present in both academic and popular discussions of the universe. It may not always be obvious, but it lurks in the background of the writings of people like Carl Sagan, Stephen Jay Gould, Robert Jastrow, Isaac Asimov, E. O. Wilson, Gerald Feinberg, Heinz Pagels, and numerous others, not to mention the more scholarly scientific works. For example, in these and other writings evolutionary theory is usually presented in such a way that it appears absolutely incompatible with any vision of cosmic purpose and, therefore, with any sort of religious cosmology. S. E. Luria capsulizes their point of view when he writes: "The essence of biology is evolution, and the essence of evolution is the absence of motive and purpose."[2] Noting such definitive rejection of teleology on the part of respected scientists, religious people are seemingly forced to choose between "religion" and evolutionary science. Many are not aware of the possibilities of presenting evolutionary theory in a way that would allow for purpose.

I realize that the above-mentioned authors would be the first to endorse a program of environmental education themselves. In some cases they have done much to educate us all in this regard. I do not want to deny any of this, nor would I wish to deny that I have learned a great deal from them myself. But their concern for environmental issues is in spite of, and not because of, their underlying philosophy of nature. The cosmology of scientific materialism underlying their ideas needs to be exposed for what it is. For it is not only not required by their science; it is fundamentally subversive of their own personal, spontaneous ecological sensitivity. I am convinced that a massive project of re-education is needed--at all levels, and especially in our universities--to uncover the inherently anti-environmentalist implications of the world-view that lies behind many presentations of modern science.

There is at least one point in Lynn White's famous essay on the historical origins of our environmental crisis that I completely agree with. This is his statement that if our environmental crisis has its origin in a certain type of religious attitude, then any healthy respect for our world can hardly be instilled in our consciousness without providing some alternative metaphysical outlook. But it is precisely in this respect that our cultural resources seem to have dried up. We live at a time in history when many "religious" people still see little connection between "this world" and their final destiny, and in which many skeptics have understandably despaired of any plausible religious vision within which to situate a truly motivating environmental outlook or ethic. The idea of the sacred and the supernatural seems alienating to them. The notion of God seems too anthropomorphic. At times the notion of mystery (which is indispensable to any teleological view) seems to have survived with some of our best-known scientists. And this same sense of mystery is vivid in the writings of Loren Eiseley, Guy Murchie, and Lewis Thomas. But even "mystery" is impalatable to many influential scientific thinkers, who consider it to be the historical mission of science to eliminate mystery altogether from the horizon of our consciousness. In Heinz Pagel's book on the origins of the universe he writes: "I believe that physicists will someday soon understand the basic laws of the quantum creation of the universe." Then ". . . the universe will hold no more mystery for those who choose to understand it than the existence of the sun. As our knowledge of the universe matures, that ancient awestruck feeling of wonder at size and duration seems inappropriate, a sensibility left over from an earlier age."[1] We may well wonder whether this program of expulsion of mystery from the cosmos provides an appropriate or truthful intellectual background for the formation of an environmentalist philosophy.

If religions are only ambiguous in their concern for nature, we must ask whether non-religious, scientifically inspired philosophy offers an alternative cosmology that might enliven our environmental concern? If we rule out any strong influence by Marxism or existentialist atheism on our thinking here, we are left with scientific materialism as the only prominent non-religious framework within which to articulate our ecological preoccupations. We may ask, therefore, whether scientific materialism is inherently consistent with or antagonistic toward an environmental vision.

Scientific materialism is the view that all phenomena in the universe, including alive and conscious organisms, consist of matter alone, and that they can be adequately understood only by a chemistry and physics that explores their molecular and atomic makeup. It holds that molecular biology and neuro-science, in disclosing the chemical basis of life and mind, have removed once and for all the plausibility of any religious reference to a spiritual or transcendent dimension of reality. Whether it is Francis Crick's statement that all biology is ultimately reducible to chemistry and physics,[4] or French brain scientist Jean-Pierre Chageux's recent contention that all mental activity is completely specifiable by chemistry,[5] the meaning is clear: matter, blind and unintelligent, is alone the sole author and substance of all that is real.

Scientific materialism is the intellectual backbone of most contemporary cosmic pessimism. It despairs of any final purpose for the universe and is obviously incompatible with the venerable teleological religious traditions. What I am asking, though, is whether scientific materialism, either in its weak or strong forms, can provide the adequate philosophical basis for a fruitful environmental reverence. So many influential scientific thinkers today hold to some version of scientific materialism that we may raise the question of its plausibility as an environmentally concerned cosmology. Given the axiom that our general outlook will inevitably influence our particular actions, it is not a purely academic question that we are engaged in here.

Scientific materialism allows for no transcendent agency in the emergence of life and consciousness. Indeed it does not allow for any true emergence at all. The term "emergence" refers to those evolutionary advances (such as the origin and evolution of life and mind) that cannot be completely accounted for on the basis of an examination of their physical antecedents. Emergent realities represent the entrance of qualitatively distinct novelty into the course of evolution. And in an emergent view of nature this newness has to have a causal explanation which lies beyond what scientific method can describe. In other words, an emergent view of the universe is suggestive of, or at least open to, a religious explanation.

Scientific materialism, on the other hand, would understand such apparently emergent realities as life, sentience and consciousness to be no more than sheer "resultants." They are the completely predictable outcome of movements in the matter-energy continuum that can be, in principle at least, exhaustively specified through scientific procedures. Evolutionary "emergence" in this view is really no more than the reshuffling of mindless and lifeless bits of stuff. Atoms and the void alone constitute sufficient explanatory elements in this cosmology.

Back in the 1920s, Alfred North Whitehead wrote that the philosophy of scientific materialism, in spite of its logical and scientific implausibility, held all the universities of the Western world firmly in its thrall.[9] I doubt that if he were around today he would significantly modify this judgment. It is not my purpose to describe such scientific materialism in detail. Nor can I detail here the fine criticisms of it that are available today, though not widely known. Here I am interested only in the environmental consequences of a widespread, if often only lukewarm and tentative, adherence to this philosophy of nature. I suspect strongly that many who fall into its camp do so because they have not been presented with an intellectually attractive alternative, and this is a tragedy. Scientific materialism seems to be the framework within which many scientific ideas are communicated, and it would be too intellectually tedious for many of us to wrest our science away from its tentacles, even though we would often like to do so. Nonetheless, I think a sound philosophical critique of scientific materialism is today an indispensable part of environmental education.

In spite of the numerous developments in science and philosophy that count against it, scientific materialism still lives on as the organizing philosophy in academic thought and in popular treatments of science. Ironically, it is in the life sciences rather than in physics that it has gained its strongest foothold today. I am not certain that many educators have seriously noted the environmental implications of a philosophy that theoretically reduces life and mind to the level of the lifeless and mindless. Scientific materialism, in its rejection of the idea of emergence and in its purely resultant universe, is not only inherently antagonistic toward any religious sense of ultimate meaning; it is also essentially incompatible with a sound environmental outlook.

This point has to be made cautiously since many scientific materialists are themselves environmental enthusiasts. It might seem ironic that many of the same pessimists who despair about the cosmos as a whole and who think of it as ultimately reducible to lifeless and mindless stuff are themselves passionately committed to the flourishing of life and consciousness in one miniscule portion of it. On the one hand they allow that there is no ultimate meaning to things, since only the void awaits the evolutionary process; but on the other hand they consider our environment to be worthy of our care and reverence.

However, to them there is no contradiction: the apparent purposelessness of life and ecosystems are not at all incompatible with our valuing and seeking to preserve them. Cosmic pessimists are often devoted supporters of environmental causes. And to them there is no irony at all. As far as they are concerned it is the very indifference of the universe at large that makes the biosphere, the domain of life, so precious and worthy of preservation. Our knowledge of life's precarious perch on the slopes of entropy causes us to revere it all the more. Its evanescence gives it an exceptional dignity and worth over against the deadness of the inorganic background that constitutes the bulk of cosmic reality. Life's statistical improbability makes it stand out sharply from its more probable inorganic horizon.

And so cosmic pessimists are often among the most enthusiastic advocates of environmental ethics. To them any worrying about a wider teleology or cosmic purpose would distract us from cultivating life's special status in our own proximate garden. Teleological speculation might dilute our natural esteem for the delicately thin membrane of living forms that evolution has unconsciously and laboriously woven around this rock we live on.

After listening to this pessimistic but enchanting proposal, we might wonder what environmental advantages could possibly reside in a teleological interpretation of evolution. In fact, would not the teleological view that there is an ultimate purpose to the universe's meanderings allow us to postpone indefinitely any genuine concern for our immediate environment? Have not religions that proclaim a cosmic teleology allowed us to lapse into indifference about the present status of the environment? Doesn't the comfort of final purpose allow us to tolerate too many abuses in the present?

Questions such as these show the need to rethink the whole issue of cosmic purpose (and of religion as such) from the point of view of environmental concern. What sort of teleological view of our emergent universe would best support an environmental ethic? Would not cosmic pessimism, with its acute sense of the utter and final perishability of life, consciousness and civilization, be just as powerful as any religious teleology in supporting our concerns?

I hesitate to think so. While on the surface our sensitivity to its perishability seems to be sufficient reason for our cherishing life, philosophically speaking it is insufficient. Mere perishability or fragility is not a rationally satisfactory basis for our valuing something. In fact, as Whitehead has shown, just the opposite is the case. Perishability alone is a disvalue, a characteristic that argues against a thing's intrinsic worth or importance. It must have some other aspects than sheer evanescence in order to evoke our reverence, and scientific materialism, as far as I can see, cannot provide these grounds. It cannot adequately explain why life can be held to be intrinsically (and not just instrumentally) valuable. Whitehead's philosophy, on the other hand, can do so.'

The reason we value life is not its fragility, but its beauty. Beauty is the harmony of contrasting elements. We spontaneously revere those things, whether natural or artificial, which synthesize and organize into themselves a wide variety of complexity, nuance, or shades of intensity. The living cell and the mammalian brain, for example, arouse our aesthetic valuation because they integrate into themselves an almost incalculable number and variety of components. For Whitehead, things have intrinsic value because of their beauty. Hence, what gives life value, and actually explains its precariousness, is the fact that it is an instance of ordered novelty, of harmonized contrast, i.e. beauty, which is always in danger of degenerating into monotony on the one hand or chaos on the other. Beauty, therefore, has an inherent instability that often renders instances of it temporary and precarious. But precariousness is not itself a value. The precariousness of living things is the result of the fact that, like all instances of beauty, they are a synthesis of order and novelty, harmony and complexity, pattern and nuance. In such beautiful phenomena the novelty, complexity and nuance always threaten to overwhelm the order, harmony and pattern, and thus reduce them to chaos. It is because of the aesthetic tension between its contrasting elements that life is fragile. But the fragility and perishability are not themselves the ground of the value to be cherished, for these are only secondary to the synthesis of harmony and complexity that give intensity to aesthetic objects. The more intense the synthesis of harmony and complexity, the more do we revere an instance of beauty. And our reverence for nature and its ecological patterning can be situated best within this aesthetic vision.

I am afraid that scientific materialism cannot deal adequately with the phenomenon of beauty, and this is the main reason why it fails to ground an environmental ethic. It is unable by itself to attribute intrinsic value to nature. It sees beauty, and all values, as simply the creation of estranged human minds who project their own subjectively arbitrary sense of what is beautiful, and therefore, valuable onto the universe. To scientific materialism, the universe is inherently valueless and purposeless. Value is the creation of minds alone, and not something inherent in the cosmos. The sphere of life can then have no more intrinsic value than that of matter. To scientific materialism as well as to many forms of humanism, nature as a totality is neutral, valueless. All value comes only from our own human valuing. Without us, the world would lack any value.

It is this assumption that has to be questioned. We need a cosmology that attributes intrinsic value to life, mind, and the cosmos as a whole if we are to have an appropriate environmental ethic flowing out of it. I think Whitehead's philosophy is one of the most sophisticated modern versions of such a cosmology. According to the logic of scientific materialism, nothing outside of us has intrinsic value, since all value is the product of human creativity. We have all heard of the extent to which an unwarranted sense of our human specialness contributes to a policy demeaning the environmental context over against which our specialness shows up by contrast. Scientific materialism is one of several modern philosophies that make room for this abusive sense of particularity. Like Descartes, Kant, existentialists and ancient gnostics, scientific materialists seem to presuppose a fundamental alienation of the human mind from the impersonal, objective natural world out of which this mind has accidentally evolved. I cannot emphasize this point enough. The sense of discontinuity between the isolated scientific subject and the senseless universe is illustrated in these remarks of a respected philosopher:

> From the standpoint of present evidence, evaluational components such as meaning or purpose are not to be found in the universe as objective aspects of it. . . . Rather, we "impose" such values upon the universe. . . . An objective meaning--that is, one which is inherent within the universe or dependent upon external agencies--would, frankly, leave me cold. It would not be mine. . . . I, for one, am glad that the universe has no meaning, for thereby is man all the more glorious. I willingly accept the fact that external meaning is non-existent, . . . for this leaves me free to forge my own meanings.[8]

Because of its inability to find intrinsic value in the universe, scientific materialism has to be rejected as incompatible with any serious environmental ethic. If its advocates nonetheless support environmental causes, this is not because of any basis in their cosmology but because of an ineradicable moral and aesthetic sensitivity that inherently contradicts their explicit philosophy. If they were to take seriously and consistently the materialist view that there is no ontological discontinuity between life and matter, then, as Barry Commoner remarks, it would not be long before they would be proven correct. A philosophy that theoretically resolves the animate into the inanimate can hardly function as the foundation of a policy that strives to prevent this reduction from happening in practice.[9]

On the other hand, if we look to religions for an alternative to cosmic pessimism we may be equally disappointed. For, as I mentioned earlier, traditional religions are at times so focused on an "ultimate" environment that they tend to disvalue the immediate one. Is there anywhere a view of ultimate reality that not only tolerates but positively promotes a healthy environmental ethic? Is there anywhere such a vision of ultimate reality that avoids both religious escapism on the one hand and a reductionist materialism on the other?

In my own search for such a vision, the closest I have come to it is in recent theologies that reinterpret the perennial religious vision of final purpose in terms of the cosmology of Alfred North Whitehead. Obviously I cannot adequately summarize or defend this theology here. Instead let me attempt simply to summarize two of the ideas of this so-called "process theology" that might bear upon the question of general vision of reality that might be supportive of an environmental concern.[10]

In the first place, process theology understands God as the source and stimulus of cosmic evolution. Instead of seeing evolution as an embarrassing scientific problem that theology can safely ignore, it understands God as a God of process. God is the creative *eros* that arouses the world to evolutionary movement, to life, consciousness, and civilization. God is the lure to adventure at all levels of cosmic evolution. Persuading the cosmos toward more intense forms of ordered novelty, God is the source of an ineradicable restlessness in our emergent environment. This means that God wills the maximization of aesthetic intensity in the cosmos. The divine dynamism promoting the intensification of aesthetic value, that is, beauty, is the most significant energy in the cosmos. It is the creative source of the emergent nature of our environment. God's will for us humans in this organismic, ecological cosmic vision is that we ourselves participate as vigorously as we can in this adventure of maximizing the beauty of the universe. Surely an environmental concern is a necessary contribution to this adventure.

The evolutionary advance of the universe suggests a cosmic aim toward more and more intense forms of ordered novelty--that is, toward heightening the beauty of the universe. God is understood here as the "final cause" of this straining of the cosmos toward beauty. The purpose of the emergent universe, its teleology, is the aim toward beauty. And the persuasive, non-coercive influence that evokes this evolutionary heightening of aesthetic intensity is, in part, what is meant by God.

In this theology, humanity is not seen as the purpose of the cosmos. We are not its only or essential reason for being. There is no need for us to hold an orthogenetic theory of evolution according to which the existence of the human race was already inscribed in the incandescent gases out of which our present universe has evolved. The human species is one of many possible outcomes of the experimentation with form that characterizes evolution. The God of evolution allows for the play of chance in the emergence of species, for this God is not coercive but persuasive. A God of love does not force or compel, but allows at every level of cosmic evolution a certain indeterminacy which at the human level is called freedom. To this freedom is issued an environmental imperative: each of us is called to contribute what we can to the intensification of cosmic beauty.

The second aspect of process theology's concept of God just as emphatically calls upon believers to envisage their lives as essentially, and not just accidentally, tied up with improving and enhancing the aesthetic intensity of our environment. I am referring to the conviction in process theology that what happens to our natural environment happens also to God. For God's being includes the world. God is not a reality that is reached only by our leaving this world behind. Rather God is understood as the reality into which all events in the universe are finally synthesized and patterned into a continually wider and more intense beauty. The intensification of nature's beauty actually contributes intensity and beauty to God's own life. God is internally affected, indeed changed, by what happens in the cosmic process. God is also in process. When nature suffers, God suffers. The religious intuition that God cares for the world can only make sense if God is internally related to what happens in the world. From a theological point of view, this means that when we work to intensify the beauty of the world we are thereby contributing aesthetic intensity not only to our immediate environment, but to our ultimate environment as well. In this view, what happens to our world matters deeply to God. In this theological cosmology, it is not possible to be a worshipper of God without a simultaneous love and concern for our natural environment.

If theologians among the readers of this paper are concerned that the notion of God-in-process jeopardizes the transcendence and perfection of God, I can only say that process theology has met these objections in a way that appears satisfactory to me. Process theology is not denying that God is absolute, for God's capacity to feel what happens in the universe is relative to nothing. We can still say that God is immutable if we mean by this that God is unchanging in fidelity to and care for the cosmos. We can still say that God is eternal, but this can have real inspiration to us only if it means that God synthesizes the world's evolutionary temporality into the divine life. "True perfection consists not in excluding everything but in including everything."[11] The classical idea of God, however, tends often to evoke images of God as lifeless, as stony immobility, as unrelated to the world. Even though human sensibility is repulsed by such images, the conceptual framework of classical theism often promotes them nonetheless. And this distortion has evoked the often justifiable protest of modern atheism. For this reason, we need a new and more lively conceptual framework for expressing the religious intuition of divine care for the world. I think process theology is at least on the way toward formulating such a framework.

In terms of this religious cosmology, the sin of environmental abuse is an aesthetic one, namely that of settling for monotony and ugliness when it is possible to preserve and enhance the cosmic beauty that is nowhere more obvious than in the sphere of living beings. And viewed theologically, it is depriving God's inner life of deeper aesthetic intensity. What happens to our environment happens also to God, our ultimate environment.

This theological vision of a divinely inspired cosmic adventure seems to me to provide the basis for awakening in us a vigorous environmental ethic. As I look at the theological alternatives, I see none that comes closer to giving us a framework within which to pull together the insights of science and religion into a cosmology that encourages in us an evolutionary adventurousness as well as a preservative care that might inspire appropriate ethical attitudes toward our environment.

NOTES

[1] Lynn White, "The Historical Roots of our Ecological Crisis," Science, Vol. 155, pp. 1203-1207.

[2] S. E. Luria, Life: The Unfinished Experiment (New York: Charles Scribner's Sons, 1973), p. 148.

[3] Cited by Michael Guillen in a review of Heinz Pagel's, Perfect Symmetry (Simon & Schuster 1985), The Washington Post Book World, August 25, 1985, p. 11.

[4] Francis Crick, Of Molecules and Men (Seattle: University of Washington Press, 1966), p. 10.

[5] Jean-Pierre Changeux, Neuronal Man, trans. by L. Garey (New York: Pantheon Books, 1985).

[6] Alfred North Whitehead, Science and the Modern World (New York: The Free Press, 1967), pp. 54-55.

[7] I have summarized Whitehead's position in my book on science and religion, The Cosmic Adventure (New York: Paulist Press, 1984). See also Alfred North Whitehead, Adventures of Ideas (New York: The Free Press, 1967), pp. 252-96.

[8] E. D. Klemke, "Living Without Appeal," in E. D. Klemke, ed., *The Meaning of Life* (New York: Oxford University Press, 1981), pp. 169-72.

[9] Barry Commoner, "In Defense of Biology," in Ronald Munson, ed., *Man and Nature* (New York: Dell Publishing Co., 1971), p. 44.

[10] For an introduction to process theology, in addition to my book *The Cosmic Adventure*, see John B. Cobb and David Griffin, *Process Theology: An Introductory Exposition* (Philadelphia: The Westminster Press, 1976). For the best discussion of the environmental implications of process theology see Charles Birch and John B. Cobb, *The Liberation of Life* (Cambridge: Cambridge University Press, 1981).

[11] Birch and Cobb, *The Liberation of Life*, p. 196.

General Session III: September 29, 1985, 1:00 p.m.

Ross S. Whaley, President, State University of New York, College of Environmental Science and Forestry.

Interdisciplinary Environmental Studies--Scholarship, Research, or Puttering Around?

I want to thank your officers and program chairman for the invitation to participate in this conference. I regret that my time with you is so limited. I know I would learn a great deal if I could participate in several of your smaller concurrent sessions and workshops.

Frankly, I am apprehensive about my ability to make even a sound, if not significant, contribution to your deliberations. Let me explain. It was several months ago when I was approached about speaking to you on the subject of the role of scholarship in interdisciplinary environmental studies. These are two subjects--scholarship and environmental studies--over which there has been considerable debate on our campus since I arrived a year and a half ago. So when asked to speak, I grabbed at the opportunity to sharpen my own thinking on these two subjects. As I tried to prepare, and tried again, my frustration mounted because for the purpose of my presentation today, these were not two subjects with two different audiences at two different points in time. They had been combined into one--the role of scholarship in Environmental Studies. What was the issue? What would I say?

* Is Environmental Studies a legitimate focus for college undergraduate programs, or majors, or graduate concentrations? Yes! Of course. This group knows that.
* Is scholarship necessary to advance our understanding of the way the world works--ecologically, socially, politically? Yes! Of course.
* Is research needed to enhance our effectiveness in communicating that understanding to the world? Yes!
* Is research in interdisciplinary fields which transcend traditional disciplines difficult? Yes! Perhaps the most difficult kind because it normally doesn't lend itself to the controlled experiment of the laboratory.

Though I am an advocate of brevity, particularly in speeches following lunch, my cryptic answers to these already long-discussed questions clearly could not be what your program chairman had in mind. So let me take a little different approach. If my comments sound a bit like a sermon, let me attribute that to the fact that it is Sunday and the prospect of speaking from a pulpit has always intrigued me.

I want to begin with a premise which I have stated many times before. The longterm welfare of any nation will be primarily influenced by (1) the way it educates their youth, (2) the way it manages its natural resources and cares for its environment, and (3) the extent to which it is embued with a well-developed sense of morality. By morality, I mean society's collective concern for issues of equity and justice (or in other terms, society's concern for a balance between who pays and who benefits from particular actions), and an individual's willingness to extend him or herself for the purposes of nurturing the growth and welfare of others (adapted from Peck, A Road Less Traveled).

If this is true, and I believe to the very core that it is, then the activities wrapped up in that broad banner of environmental education or its university component, environmental studies, are not trivial business. I mentioned to the faculty of our college last week that our work is so important that it is imperative to give it our "best shot." With anything less, we are letting down our colleagues who are approaching their work with a sense of urgency or the zeal of crusaders. With anything less, we are letting down the student crying out to be challenged. With anything less, we are letting down a client who has contracted with us for research focused on a pressing environmental problem. Or to fully express my biases, to fail in some academic disciplines is indeed unfortunate, to fail in our own is courting disaster.

Failure in environmental studies might come from two sources. First is poor performance; we simply didn't try hard enough. Or second, and more likely, is inadequate scholarship which results in inadequate solutions for complex problems.

Let me now take a brief side trip to look at what I mean by scholarship before I conclude with particular needs for its application to environmental issues. First, I do not use the words "scholarship" and "research" interchangeably. While some scholarship may take the form of research, not all of it is. To stress how strongly I feel about the role of scholarship in the University, and to distinguish scholarship from research, I submitted the following statement to our faculty regarding their evaluation:

> Though individuals will vary in their relative contributions to teaching, research, and extension, every faculty member is expected to excel in one or more of these areas and is expected to give evidence of scholarship.

Therefore, though one might argue that he or she was hired as a teacher and not as a researcher (we don't have many of those), no one is excused from scholarship.

What is this thing called scholarship? (These thoughts have been stolen from Dr. James Palmer, then slightly twisted to conform to my own biases.) Scholarship has three attributes:

First, scholarship must include some significant original creative thought. At best this means truly new ideas, but it may also include new synthesis of the ideas of others. Originality is clearly a judgment call, but it is obviously important . . . . [For example] the editor of a collected volume or conference proceedings, a most worthwhile task, is not engaged in a scholarly activity. Simply brokering or presenting the ideas of others is an important activity, but it certainly is not scholarship. On the other hand, someone who critically evaluates, interprets, or synthesizes the work of another could logically be involved in scholarship.

Second, scholarship must include a meaningful attempt to communicate ideas to interested parties. Though communication may take many forms, it must make clear the suppositions or bases upon which conclusions are derived. Just as research must be communicated in such a manner that the procedures with their concomitant results can be replicated, the work of the scholar must be shared in such a way that it can be challenged.

This leads to the third attribute of the scholar, to evaluate critically the work of others and to submit his or her own work for similar evaluation. Peer evaluation plays an important role in scholarship. Our ideas need to be regularly tested, and we need to help others test their ideas. By this criterion some artists are scholars, but some are not. Some believe that their art does not need explanation and is above criticism; it is its own raison d'etre. By removing their work from serious criticism they have removed themselves from sincere scholarly activity.

Now, what about scholarship and environmental studies? The need for original creative thinking aimed at solving existing and pending environmental problems simply cannot be denied. I would add that the ultimate purpose of such creative thinking is to develop a society characterized by a Readiness and Responsibility to face turbulent times (Gordon MacDonald). While readiness involves understanding the complex nature of environmental stresses and identification and ranking of alternative solutions, responsibility involves leadership, discipline, and the will to act.

Any list of the pressing problems for which research and scholarship are demanded to cope with maintaining a quality living environment while it is under siege from every direction would be too long even to list here. I would like to suggest three broad areas for your consideration: global maldistribution of resources, the development of an environmental morality, and the development of political and regulatory mechanisms to substitute for the absence of a commonly shared morality.

While issues of acid rain, toxic waste disposal, and urban blight are certainly significant problems to our society, I think they pale compared to the larger issues of global maldistribution of resources. Let me explain. A few years ago while working on the Assessment of Renewable Resources published by the U.S. Forest Service, I was struggling with trying to place the U.S. resource perspective in the appropriate global context. There is abundant evidence from the literature that the growth of population combined with worldwide aspirations for economic growth could lead to massive resource scarcity. This situation was forcefully brought to the world's attention several years ago by Dennis Meadows and his colleagues in their book, Limits to Growth, and was reinforced more recently by President Carter's release of Global 2000. These studies and others like them brought data and analysis to bear on what others had been prophesying for years, without the aid of computers. Then, to add urgency to this concern, many have been pointing to the energy shortages of the past decade or starvation in the Sahel region of Africa as evidence that the decade of the 1980s is a pivotal decade in which severe shortages become impediments to increasing the well-being of the world's population--dooming the poor, the ill-housed and ill-fed, to continue in that condition or, if imaginable, even worse.

The problem with all of these forecasts is that for every article or book published with these conclusions, I can show you another one which concludes there is no problem. For every Meadows there is a Simon, for every Gerald Barney a Herman Kahn. The argument of the optimist is a compelling one. There is no statistical evidence to support the increasing shortage premise. If you look at length of life, caloric intake, education levels, per capita income, or other indices of the quality of life, they have been improving over the past several decades and there is no apparent downturn. So where is the argument for scarcity? A strong (but I think erroneous) argument.

A point on which both optimists and pessimists must agree, however, is the problem of maldistribution. Even accepting the most optimistic scenario of controlled population growth and technological advances increasing the availability of resources, one must conclude that there is not a desirable geographic congruence between where the people and the resources are located. At best, it is a scenario of extreme poverty in the midst of abundance. This could well be at the heart of future environmental and diplomatic problems. It is a situation which demands scholarship of the highest order in applied biology and technology: even more important, it demands synthesis of the findings of our disciplinary brethren into workable economic and political mechanisms.

A second area of serious concern to me is the lack of a common sense of individual morality with regard to maintaining a quality environment. The environmental era of the 60s and 70s was quite successful in developing a "public" social conscience, or at least a social awareness of the perils of environmental degradation. This was in no small part the result of the efforts of people in this room and your compatriots. For this I thank you. But I am continually struck by the fact that while our social conscience was raised, our sense of individual responsibility was not even tweaked. Yes, we started the dialogue on issues of equity and justice or on social costs and social benefits, and we made progress at influencing some of our public and corporate institutions to address issues of equity, but I see virtually no evidence that this was in any way individualized to a sense of my responsibility to extend myself for the purpose of nurturing the welfare and growth of another. If my first concern, global maldistribution, dealt with the first part of your name (that is, the Environment in Environmental Education), then this concern deals with the second, Education. If I were to grade you on your role of enhancing social awareness, I would give you an A-. If I were to grade you on developing a sense of morality amongst the citizenry, you would take the course over again. That this occurred, however, is not because of a lack of effort. We need the creative scholarship of our best minds to deal with this--perhaps the greatest dilemma facing our society today.

The last area which I will mention as a high priority for our attention is that which deals with what are the most effective substitutes for the absence of a commonly shared sense of morality. What are the institutions necessary to mitigate honest differences of opinion over the use of our land and resources? I reflect back on my experience in observing the U.S. Forest Service struggle with evaluating 250,000 pieces of mail from the public signed by more than 300,000 individuals, all expressing their opinion on the designation of certain National Forest lands as wilderness. How do you effectively incorporate a variety of value judgments, opinions, and aspirations into public policy and regulations? Breakthroughs in this area have thus far escaped the best minds of political scientists. If we are only beginning to deal effectively with these problems on a domestic level, how well will we do when addressing comparable concerns on a global level?

For me, then, the subject of *Environmental Studies--Scholarship, Research or Puttering Around* goes well beyond the question of how academics at the university level earn tenure or promotion, or if is it necessary for practitioners to also be scholars. This subject deals with the need for creative thinking, clearly communicated and critically evaluated, as essential to the welfare of humankind.

General Session IV: September 29, 1985, 6:45 p.m.

Paul F. Brandwein, formerly, Adjunct Professor, Conservation and Education, University of Pittsburgh; and Director of Research, Editor-in-Chief, Department of Schooling and Education, Harcourt Brace Jovanovich.

Summarizing a Paradigm: Factors in the Ecology of Achievement of Originative Workers in Conservation.

All the young who will become conservationists, those who will do originative work to advance knowledge, attitudes, and skills in conservation, are, or will be, in our schools. This is true also of all our citizens who will be obliged--whatever their vocations--to become stewards of our small planet. It is reasonable to assume that we are obliged to look to their future by the devices available in schooling and education.

In The Anatomy of Reality (1983), Jonas Salk reminds us "In the face of the magnitude of our problems, we are in deep need of recognizing extraordinary human beings." And ". . . it is possible that a *new human preoccupation* may be in the process of emergence, i.e., a preoccupation with human creativity" (italics mine). In short, with the kind of leadership that transcends the problem, with innovation and originative work that informs the term "crisis" with a truer meaning: a turning point--"that point of time when it is decided whether any affair or course of action must go on or be modified, or terminate." Indeed, Daniel Bell (1973) makes a strong case for the necessary and inevitable change with his insistence that the world is at one of its strange turning points. The strong implication is that leaders--that is, innovators, originators, scholars, change-agents (whatever synonym pleases the reader)--can and often do create innovations and new environments which advance civilization, or in the misuse of gift and innovation may hinder the advance.

It is not naive to say that these researchers who have focused on the gifted have recognized that in one way or another leaders or scholars develop the fundaments of their special integrity early in their lives and that it is here in the special opportunities we call schooling (and in the total environment we call education) that their *ecology of achievement* begins its development. The two, schooling and education, require different strategies: schooling is concerned generally with intended experience or instructed learning, where the risk is minimized; education, per se, may also include learning, unplanned and chancy--even risky--experience.

On A Certain Duality in Gifts

In any event, let us take the term "originator", "leader", or "gifted individual" not only to mean *endowed or gifted with special faculties* but also to mean one who *endows the culture with his or her "gift"*--a work, an originative work, to be sure. I incline to the view explicated by Bronowski (1956), who emphasized the hidden likenesses to be found in the mind's creative acts in the arts and sciences, that is, non-empirical and empirical thought. Stent (1972) inclines to this view as well. He finds a commonality in the traits of artists and scientists (and as will be seen, I find a fusion of art and science in the creative work of the conservationist). He emphasized that significant statements of scientists "pertain mainly to relations between or among public events," while artists' statements "pertain mainly to relations between private events of affective significance." He posits that in both the arts and the sciences, acts of origination or leadership would mean the formulation of a *new, meaningful statement* about the world, an *addition* to the accumulated capital of what is sometimes called "our cultural heritage."

In seeking hidden likenesses in the work of scientist and artist, both Bronowski and Stent italicize a definition of creativity which requires emphasis: the creative act adds an originative work, a new unity, a *new and meaningful work* to the culture. Put another way, *whatever tests validate the promise of doing originative work* (synonyms: *giftedness, creativity, talent, leadership*) *in the school years, we are obliged to consider the promise unfulfilled unless the culture, sub-culture, or an element of society is endowed with that gift*, whether the gift is a work of science, of art, of politics, or the critical advance of an institution or a cause. Moreover, let me posit that gift as *dual*, or *existing in a duality*. In an *ecology of achievement*, the individual "succeeds" or "fails" within benevolent or malevolent environments, or as is often the case in spite of them.

Originative Workers and Their Dual Gift

I come down hard on the side of the view that the new, meaningful statement, as a *contribution* should in its origins have humane intent, that is, of course, plainly the intent of the leader in the acts of conservation or in the study of conservation.

The originative act begins, of course, with some statement, some fact or artifact, generally accepted by the culture of which the individual is a part. The contribution or originative work culminates, however, in a *new* meaningful statement, or act, or judgment. But the contribution, the originative work is *not* the sole measure of the gift of origination of the gifted, originative worker.

In the mature workers I have studied, the factors in their ecology of achievement are made evident (that is, they are observable) in at least three constellations of traits:

First, there is apparent a *standing quarrel with the culture*. The conservationist stands squarely and unalterably for a sanative (synonym: healthy and healing) environment; the culture, as presently generally constituted, is at best neglectful or careless, and at worst, poisons and pollutes and is destructive of the healthy ecology that nurtures life.

The originative worker, the active conservationist, persistently articulates in the act and word this standing quarrel. This *standing unalterable quarrel*, Lionel Trilling maintains (1955), interpreting psychodynamic theory, is the originative workers' first gift: a benevolent gift, for it pits innovators against the culture, that total environment which "mothered" and "fathered" them. In brief, the originative worker aspires to nothing less than a change in the culture.

Second, if the originative worker perseveres and continues to contribute acts or works intended to alter the culture, and learns the social courtesies that make the contributions acceptable, the contributions are in fact, a second gift: the first being a gift or self, the second being a gift of a contribution. The standing quarrel thus has turned into a "lovers' quarrel" (Greenacre, 1957).

Third, basic to the maintenance of the *will* to contribute to a culture not in accord with the contributor's view or the contribution, is the originative worker's milieu (Nisbet, 1982). A milieu, in the French sense of the term, is nothing less than a fusion of the "moral" or ethical sense with the larger intellectual environment (natural, social, political, economic, etc.), a fusion of non-intellective with intellective factors. The milieu is thus hard-tried and hard-won.

Brush Strokes in a Noietic and Synoetic Portrait

In unforgivable haste, I have sketched a kind of "portrait" of three hard-won features of the originative worker in conservation. Let us now turn to paint in broad strokes the major elements of his or her milieu: they are, in effect, the product of heredity and environment, the basic interacting, undergirding of an ecology of achievement. The "multiple intelligences" (Howard Gardner's term, 1983) interacting with "multiple environments" that are the fundaments or armaments undergirding the individual's achievement may well be examined from the *noetic*, the variety of knowledges, attitudes, and skills that come out of schooling and education and give the individual knowledge of the total environment, and the synoetic, the multiple knowledges and intelligences that give the individual knowledge of self, and in effect, undergird a self-image.

A view of curriculum practices in conservation studies in the schools persuades me that unlike most requisites in the curriculum which are tested, the elements of what we now call a "curriculum" in conservation are at the mercy of the whims of schedule and time; they are dispersed among various subject matters, discretionary upon the teacher because not required for graduation or present in college entrance requirements--in a word, haphazard. Recall that generally speaking the curriculum as approved by Boards of Education is non-discretionary; it "must be covered."

Conservationists cannot count therefore on the noetic aspects, the obligatory aspects of a curriculum undergirding knowledge, attitude, and skills in conservation to be part of the schooling of most Americans (Brandwein, 1978, 1981). In other words, we cannot count on what Phoenix (1964) called "realms of meaning," and Havighurst (1953) called "developmental tasks", and Brandwein (1981) "essential behaviors." Briefly these meanings, tasks, or behaviors fall within the realms of:

symbolics--use of language, discursive or non-discursive, left and right brain symbolism,affecting literacy and numeracy, and the like;

synoptics--fields that synthesize knowledge accessible to development of a world-view, i.e., history, philosophy, religion, comparative studies of literature, and the like;

aesthetics--the study of the fine arts, of form, of color, of beauty;

ethics--studies related to moral action, motive, and character, nature of right and wrong;

empirics--studies devoted to modes of seeking self-correcting knowledge, to scientific and mathematical inquiry, and the like.

These five realms, basic to all fields of knowledge, fall within the noetic sphere, the spheres of multiple intelligences generally undergirding conscious knowing.

These realms of meaning generally undergird what we commonly call "curriculum," which we consider to be a design for the reduction of complexity of the culture for purposes of schooling, surely of the relevant, significant, and essential aspects of the culture. Even in casual thought, we cannot deny that the five areas mentioned above are basic to the knowledge, attitudes, and skills, that is, to the framework of all intellective subject matter. These, of course, include conservation. However, on the basis of considerable observation, I may conclude that conservation as a subject matter worthy of sequential study now accorded other subject matters is now left to the generally non-sequential and random nature of the educational experience--not to the non-random, instructed learning that comprises schooling. Is it our obligation at this critical time in the history of our culture to develop and introduce such a course of study into schooling?

Moreover, as indicated, the synoetic element, so-called "non-intellective" in nature, but nonetheless a critical aspect of the multiple intelligences active in self-knowledge and in the forming of self-image, an aspect of the requisite ability of individuals to live equally within the opposites that plague them, to form the ethic undergirding stewardship of the environment, is almost entirely absent from the school curriculum. It is left to chance development. There are few investigators of leadership or scholarship who fail to underscore the significance of the synoetic aspect in the development of the originative worker affected by the variety of stresses coming out of the effort to forge a contribution to the culture of a new and meaningful statement (see Arieti, 1972; Brandwein, 1978; Erikson, 1976; Maddi, 1975). Thus:

> To accept the task of solving a scientific problem--an unknown--means, in a sense, being alone. It means facing uncertainty and ambiguity, the possibility of failure, the highs and lows in emotion--from exultation joy to depression and despondency--and eventually, the coalescence of dissimilar units in a 'solution'. . . which leads, of course, to new problems. This constant alternation of problems with solutions, of conflict and coalescence, of exploration and illumination requires courage and persistence - in a word, character. (Brandwein, 1981; p. xii.)

Erich Fromm (1968) would perhaps not use the term "character," but would postulate the presence of "character-rooted passions." The field of the synoetic is the battlefield of emotions, of feelings, of choices, of problem-solving, of character-seeking, of maturity-seeking, of the search for unity in divergent and diverse elements. It is the battleground of opposites; this conciliation of opposites and conflicts may well furnish the ground of creativity. Seemingly, in the struggle to create, we are all double-people, "divided selves" (Maddi, 1975; Erikson, 1976), seeking wholeness. The originative worker is particularly so. Minerva doesn't spring full-grown out of the head of Zeus, but slowly, with doubt and often agony, out of the environment that eventually becomes the personal milieu, that is, the adornment of the leader and the originative worker.

Hudson (1966) sums it up plainly in stating that to do creative work depends "not so much on an individual's intellectual apparatus as the *will* to use it" (italics mine). Whatever the will is, surely it does not disdain the *habitual vision of greatness* held before the young by teachers or mentors who care that the young become as compassionate as they are competent, human, and humane. And perhaps in this environment, this world at a turning point, it will be essential in benevolent schooling and education, and in a hard-tried and hard-won personhood, *to reach the ultimate:*, to become more than human. Otherwise will we prevail?

NOTES

1. This initial study is based on observations of fourteen conservationists over a period of 7 years (1952-1959), when the study provided a ready field of observation when I worked successively on the staffs of three organizations directly concerned with conservation. I was also involved in the Biological Science Curriculum Study in which a number of conservationists were participants. I have since then checked the paradigm against other observations made in my associations with the Ekistics and Human Habitats Study.

2. This brief statement, a summary of an address given at the September 29, 1985 meeting of the North American Conservation Education Association, is based on analyses and observations and data from a study tentatively titled: *Artist and Scientist: The Ecology of Achievement* by Paul Brandwein and Evelyn Morholt.

REFERENCES

Arieti, S. *The Will to be Human*. New York: Quadrangle Books, 1972.

Bateson, G. *Mind and Nature. A Necessary Unity*. New York: Bantam Books, 1979.

Bell, D. *The Coming Post-Industrial Society: A Venture in Social Forecasting*. New York: Basic Books, 1973.

Brandwein, P. "The Selection and Training of Future Scientists." *Scientific Monthly*, 54, 1947.

Brandwein, P. The Gifted Student as Future Scientist. New York: Harcourt Brace & Co., 1955; New edition: National/State Leadership Training Institute on the Gifted and Talented, Ventura County Superintendent of Schools Office, Ventura, CA, 1981.

Brandwein, P. "Creativity and Personality in the Scientist." Yearbook, National Society for the Study of Education, 1959.

Brandwein, P. "Science and Technology: Humane Purpose and Human Prospect." In Improving the Human Condition, 1978 Yearbook, Association for Supervision and Curriculum Development, Washington, DC: 1978.

Brandwein, P. Memorandum: On Renewing Schooling and Education. New York: Harcourt, Brace, Jovanovich, 1981, revised 1982.

Bronowski, J. Science and Human Values. New York: Harper, 1956.

Clepper, H. Origins of American Conservation. New York: Ronald Press, 1966.

Clepper, H. (ed.) Leaders of American Conservation. New York: Ronald Press. 1971.

Erikson, E. "Reflections on Dr. Borg's Life Cycle". Daedalus, 105:2, Adulthood. Proceedings of the American Academy of Arts and Sciences, Cambridge, MA: A.A.A.S., 1976.

Fox, S. John Muir and His Legacy: The American Conservation Movement. Boston: Little, Brown, 1981.

Fromm, E. "The Creative Attitude." In H.H. Anderson (ed.) Creativity and Its Cultivation. New York: Harper Row, 1959.

Fromm, E. The Revolution of Hope. New York: Harper, Row, 1968.

Gardner, H. Frames of Mind: The Theory of Multiple Intelligences. New York: Basic Books, 1983.

Greenacre, P. "The Childhood of the Artist: Libidinal Phase Development and Giftedness." Psychoanalytic Study of the Child, 12, 1957.

Havighurst, R. Human Development and Education. New York: David McKay, 1953.

Hudson, L. Contrary Imaginations: A Psychological Study of the Young Student. New York: Schocken Books, 1966.

Huxley, A. Personal speech.

Maddi, S. "The Strenuousness of the Creative Life." In I. Taylor and J. Getzels (eds.), Perspectives in Creativity, Chicago: Aldine, 1975.

Nisbet, R. "Genius." The Wilson Quarterly. Special Issue 6: 5, 1982.

Phenix, P. The Realms of Meaning: A Philosophy of the Curriculum for General Education. New York: McGraw-Hill, 1964.

Roe, A. The Making of a Scientist. New York: Dodd, Mead, 1953.

Rogers, C. "Towards a Theory of Creativity." In H.H. Anderson (ed.), Creativity and Its Cultivation. New York: Harper, Row, 1959.

Rogers, C. On Becoming a Person. Boston: Houghton, Mifflin, 1961.

Salk, J. The Anatomy of Reality. New York: Columbia University Press, 1983.

Stent, G. "Prematurity and Uniqueness in Scientific Discovery." Scientific American, December 1972.

Taylor, C. "Developing Creative Excellence in Students: The Neglected History-making Ingredient Which Would Keep Our Nation From Being at Risk." Gifted Child Quarterly, 24: 1984.

Toynbee, A. "Is America Neglecting Her Creative Talents?" In C. Taylor (ed.), Widening Horizons in Creativity. New York: Wiley, 1964.

Trilling, L. Freud and the Crisis of Our Culture. Boston: Beacon Press, 1955.

General Session V: September 30, 1985, 8:15 a.m.

Gus Speth, President, World Resources Institute.

Environment and Development: Toward New Policies and a New Politics

It is a great pleasure and honor for me to join you this morning, even if it is 8:15 a.m. The advancement of environmental education is so fundamental to human betterment at home and abroad that showing up here to share these thoughts with you is the least I can do. I only hope I can overcome the soporific effect of oatmeal and doughnuts.

I want to talk with you this morning about what I see as an emerging agenda of global-scale environmental concerns, and the links between these concerns and the terrible problems of underdevelopment in the Third World. In so doing, I hope I can provide a policy and political framework for the theme of your sessions, "Progress Toward a Sustainable Future."

Consensus seems to be emerging within the international scientific community and among other experts on exactly what are the priority environmental and resource problems, at least given the current state of our information and understanding.

In 1982, the Royal Swedish Academy of Sciences convened a week-long gathering of 35 eminent scientists from North and South, East and West, to look at environmental priorities for the 1980s. At least 40 issues had been targeted ahead of time for serious consideration, and one goal of the meeting was to trim this to a short list of front-ranked items.

More recently, 75 leaders from science, business, government, and environmental affairs representing twenty countries were brought together for several days by the World Resources Institute for a conference entitled The Global Possible: Resources, Development and the New Century. Again, a goal was to identify key concerns of global scope and what to do about them.

These two exercises produced very similar results regarding priority concerns--results that have been reached by others as well. Both efforts identified the following problems as truly serious and deserving of wide international attention:

1. loss of crop and grazing land due to desertification, erosion, conversion of land to non-farm uses, and other factors. The United Nations reports that, globally, farm and grazing land are being reduced to zero productivity at the rate of about 20 million hectares a year.

2. depletion of the world's tropical forests, which is leading to loss of forest resources, serious watershed damage (erosion, flooding, and siltation), and other adverse consequences. Deforestation is projected to claim a further 100 million hectares of tropical forests by the end of this century.

3. mass extinction of species, principally from the global loss of wildlife habitat, and the associated loss of genetic resources. One estimate is that more than 1000 plant and animal species become extinct each year, a rate that is expected to increase.

4. rapid population growth, burgeoning Third-World cities and ecological refugees. World population will most likely double by the early decades of the next century, and almost half the inhabitants of developing countries will live in cities, many of unmanageable proportions.

5. mismanagement and shortages of fresh water resources. Water-borne diseases are responsible for perhaps 80 percent of all illness in the world today.

6. overfishing, habitat destruction, and pollution in the marine environment. Twenty-five of the world's most valuable fisheries are seriously depleted today due to overfishing.

7. threats to human health from mismanagement of pesticides and hazardous substances and from pathogens in human wastes and aquatic vectors. An estimated 1.5 to 2.0 million persons in developing countries suffer acute pesticide poisoning annually, and pesticide-related deaths are estimated at 10,000 a year.

8. climate change due to the increase in "greenhouse gases" in the atmosphere. The steady build-up of carbon dioxide and other gases in the atmosphere, due principally to fossil fuel burning, is predicted to create a "greenhouse effect" of rising temperatures and local climate change--the question increasingly is not "if?" but "how much?" For a variety of reasons, poor countries are likely to suffer disproportionately from the consequences of climate change.

9. acid rain and, more generally, the effects of a complex mix of acids, ozone and other air pollutants on fisheries, forests, and crops.

10. mismanagement of energy fuels and pressures on energy sources; though this crisis is in temporary remission in

> the developed countries, the high costs of oil imports and fuelwood shortages continue to plague much of the developing world.

It is instructive to reflect on this list for a moment. Taken together, these ten problems seem mainly to stem from excessive poverty and population growth in the developing countries or from the careless and excessive use of certain technologies and resources in the developed countries.

Taken together, the cumulative impacts of these ten problems pose a tremendous threat to the prospects for human betterment. The World Conservation Strategy, published jointly by IUCN, UNEP, and WWF, summed up the situation well:

> Human activities are progressively reducing the planet's life-supporting capacity at a time when rising human numbers and consumption are making increasingly heavy demands on it. The combined destructive impacts of a poor majority struggling to stay alive and an affluent minority consuming most of the world's resources are undermining the very means by which all people can survive and flourish.

While the U.S. and other developed countries are affected by most of these problems, the cumulative impact of these threats is far more serious in the poor countries than in the rich. Environmental protection of the productive resource base--soils, fisheries, forests--is particularly critical in developing countries, which on the average are six times more dependent than industrial countries on these natural resources. Yet these resources are being eroded today far more rapidly in the developing world than in the industrial countries. As a result, development projects are often failing and long-term growth prospects are being diminished.

The director of the international newservice, Earthscan, has summed up the situation in blunt terms;

> A great deal of development in the Third-World--perhaps most of it--does not work. It is quite simply a waste of money, because it is not environmentally sound, and is therefore not sustainable....
>
> It is sometimes argued that a concern for the environment is a luxury for rich nations, something the Third-World cannot afford. This is nonsense, but one can understand why some people in the South believe it to be true. When we in the North talk about environment, people in the South often suspect that we simply want them to protect wildlife and establish national parks, and that all we really mean by development is building hotels so that rich

> white tourists can come photograph lions.
>
> But environmentally sound development is not really about wildlife at all, important though wildlife may be. It is about development, and whether or not this development works. If development is environmentally unsound and nonsustainable, if it damages and destroys the forests and water and soil and clean air, then it is bad development, development that will not work. And phony development of this kind hits hardest at the poor.[1]

Increasingly, Third-World leaders are showing concern about environment and resource deterioration. As a result, the number of environmental agencies in developing countries jumped from 111 in 1972 to 110 in 1984. Yet, while legislation to protect the environment in developing countries is now virtually universal, implementation, enforcement, and monitoring are often grossly deficient. Even where the political commitment is present, lack of financial resources, staffing shortages, poor training, inadequate technical resources, and lack of information all create special vulnerability.

If this is an accurate picture, and I believe that it is, an important question arises: what is the significance of these 10 problems for U.S. policy and politics? What are the prospects for responsive U.S. action, and how can those prospects be enhanced? Note, first, that these problems are not, by and large, the environmental concerns to which the U.S. and other industrial countries turned priority attention in the early 1970s. While many of these problems have been recognized for some time, they represent new policy and political challenges for the United States, challenges that are more international and global in scope and implication.

These emerging concerns have scale and scope that encompass the great life-supporting systems of the plant's biosphere--the atmosphere, oceans, climate, soil, and forests. Today, issues arise from the spread of deserts, the loss of forests, the erosion of soils, the growth of human populations, the exhaustion of ecological communities, the accumulation of wastes, and the alteration of the biogeochemical cycles of the planet. These newer environmental concerns transcend boarders, national laws, and local customs. As a result, the politics needed to meet present and future challenges require a new vision and a new diplomacy, new leaders, and new coalitions.

Environmental leaders in the U.S. and abroad are turning attention increasingly to these issues; under their pressure and the press of events such as those at Bhopal and in Ethiopia, a new environmental agenda is emerging in the U.S. It is now beginning to force itself on the attention of policymakers and the public at large. Once fully visible, this agenda will scarcely resemble the old predominantly domestic environmental agenda of a decade ago.

There are compelling reasons for a high level of concern and response to this new agenda: reasons of humanity, of environment, of science. But increasingly we are seeing that the new agenda is important because it can profoundly affect U.S. economic and security interests. The new agenda will demand attention in the 1980s and 1990s in part because its concerns are inextricably linked to other pressing international goals:

- expanding international trade and markets,
- improving North-South relations,
- promoting sustainable economic development,
- managing the pressures of population increases, and
- ensuring long-term political stability in the Third-World.

Starting about fifteen years ago, U.S. leaders in Congress and elsewhere responded vigorously to the environmental concerns prominent then. Today, we face an emerging agenda of environmental resource, and related, development issues that, if anything, are even more important to our basic values and long-term interests than the concerns of the 1970s. Granted that these newer concerns are less "in our own backyard" and thus harder to grapple with politically. Still, the emergence of this new set of critical issues present U.S. leaders, both in government and in the private sector, with a special opportunity and responsibility.

The politics of this new agenda are different from the U.S. environmental politics of the past decade. The predominantly domestic environmental causes of the 1970s had nothing going for them but the people. The environmental movement handed the business community a long string of stinging defeats; it left the scientists breathless in their effort to keep up. Economists were aghast; ecologist, even lawyers, were lionized. Citizens took on government at all levels, and won. Only the people loved it, and they still do, as the Reagan Administration has learned the hard way.

The politics of the new agenda are different. It must be a search for common ground. Popular support for the new agenda is weaker than for the old: the issues are more remote, more distant in space and time. Although there are conspicuous exceptions (like acid rain), the new agenda addresses the relationship of environment and development in the Third-World, the health of the global commons, and a series of resource and environmental threats that, while serious, are less visible, often slow to develop, or affect the U.S. only indirectly.

But, as if to compensate, the new agenda invites strangers and even old antagonists to work together. Economic growth is needed to attack poverty, the worst destroyer of the environment worldwide, so businessmen and environmentalists must make common cause in promoting sustainable growth. Economists and ecologists must cooperate if development strategies are to promote this goal. The development, population, and environmental communities now face the same set of problems. The bureaucracy--the relevant national and international agencies--now almost immune from lawsuit and able to cloak itself in the mysteries of foreign policy and national security, must be wooed on its own terms. Yet, it too will not succeed unless it comes to terms with global-scale resource, environmental, and population issues.

The emergence of the new agenda has been accompanied by a growing realization that environmental conservation and economic growth in both developing and industrial countries are more complementary than often depicted. The natural resources under stress today are vital to healthy, long-term economic development and growth. Conversely, the conservation community in the U.S. and elsewhere is increasingly aware that resource pressures in developing countries will not be alleviated without economic growth to provide people with non-destructive livelihoods. Some of the worst environmental destruction occurring in the Third-World today stems from the impacts of poverty on the land. For both these reasons, a firm basis exists for collaborations between the development and environmental communities.

I mentioned earlier that environmental and population challenges would demand increased attention from U.S. leaders because they are linked to U.S. economic and security interests. One important way the U.S. economic future is tied to global population and environmental problems is through the effects that these problems have on economic development. To state the matter simply, the better resource and population challenges are managed in the developing countries, the greater the prospects for sustainable economic development in those countries. And sustainable development means a greater boost for developed economies. In light of growing North-South economic ties, resource and environmental degradation in developing countries--including the failure to find attractive substitutes for high-cost energy imports, to manage renewable natural resources for sustainable production, and to protect public health from environmental diseases--can and will affect U.S. economic performance adversely.

Our foreign policy and security interests are as much at stake in the Third-World as are our economic interests. There will be many more people on this earth soon. Without needed changes, a large portion will join the legions who already live with constant hunger, illness, and illiteracy. If we allow their numbers to grow, if we allow economic development that is unsustainable, and the pressures of people on resources increase, political tensions and conflicts will rise. The effects will be felt in every sphere of political relations, from waves of "ecological refugees," to conflict over scarcer land and water, to increasingly isolationist trade and then foreign policies.

The history of our country is replete with instances in which "national security" has been interpreted in almost exclusively military terms. Given the linkages among population, resource, economic, and political factors, a broader concept of our own long-term security interests is essential for the decades ahead.

As we look to the future, I hope we can begin to explore the policies that make sense in light of the environmental and development experiences of the past decade--in light of our successes and our failures. As we make this effort, we should proceed with a sense of realistic optimism. To date, the principal contribution of my organization, the World Resources Institute, to this effort has been the Global Possible Conference, in which we went beyond dire warnings to formulate constructive options. The statement issued by the Conference was not pollyannish, but it was not "gloom-and-doom" either:

> At a time when bleak predictions are all too familiar, the Global Possible Conference was convened to re-examine the relationship between earth's resources and the human future. The Conference accepted that these predictions could be accurate. But its central and emphatic message is that they need not be--that it is possible to build a world that is more secure, more prosperous, and more sustainable both economically and environmentally.
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> * * *
>
> We must mobilize now to achieve the global possible. If we do, the future can be bright. We have sufficient knowledge, skill, and resources--if we use them. If we remain inactive, whether through pessimism or complacency, we shall only make certain the darkness that many fear.

The 75 distinguished international experts and leaders who came together from the Global Possible Conference were unanimous in the view that the challenges of the new agenda deserved sharply increased attention from governments, the private sector, and others. As grave as our resource and environmental problems are, the Global Possible conference agreed, the challenges *can* be met with means that are within our grasp. The group proposed 94 specific steps which, taken together by public and private sectors alike, can make a difference.

The conference's recommendations point to five transitions essential to a world at once sustainable and renewed:

- a *demographic* transition to a stable world population;
- an *energy* transition to a post-petroleum era in which energy is produced and used at high efficiency;
- a *resource* transition to reliance on nature's "income" and not depletion of its "capital;"
- an *economic* transition to sustainable growth and a broader sharing of its benefits; and
- a *political* transition to a global bargain grounded in complementary objectives between North and South.

The North American Association for Environmental Education can play a large role, I believe:

- in calling to attention to what I have called here "the new agenda;"
- in calling attention to the resource and environmental problems of the Third World; and
- in raising our sights beyond our immediate backyard concerns to longer term, more global problems that will increasingly affect all of us and the next generation in the years ahead.

In doing so, you would be making an important and badly needed contribution. And I can assure you that we at World Resources Institute would be happy to cooperate with you in such an effort.

NOTE

[1] Jon Tinker, "On the Side of the Future," *Earthscan*, 1984, pp. 1,3.

General Session VI: September 30,1985, 11:20 a.m.

M.Lynne Corn, Legislative Assistant to Representative Mike Lowry (D-Washington)

Congressional Politics-An Introductory Lab

(Text is not Available)

General Session VII: September 30, 1985, 5:00 p.m.

A Reception at the National Zoo, sponsored by The Alliance for Environmental Education

General Session VIII: October 1, 1985, 8:15 a.m.

Cheryl Charles, Director, Project WILD.

Wholearth Learning: Sustaining and Enhancing a Liveable Future

It is a personal as well as a professional pleasure to have the opportunity to address this Conference--personal in that so many of you are friends and associates for whom I have enormous respect and affection, professional in that it is an exceptional gift to be in such a setting with so many who share a common concern for education within and about the environment

I would like to focus on the theme of this Conference--Environmental Education: Progress Toward A Sustainable Future--by emphasizing Wholearth Learning for a Liveable Future. I will offer a perspective on education within and about the environment--from person to planet and back again to person. I will describe some of what I see in the field of environmental education; I will also comment on some of what I would like to see. I will suggest that I think we have accomplished a lot in the past few decades--and further that of course we have a great distance yet to travel. I will ask you for comments or questions, and I will close with a few images and sounds.

To begin, I would like to ask you to reflect a moment on what you want young people to know and to experience in order to best prepare themselves for a sustainable future of peace and quality on a healthy planet. Think about what you want young people to know and to experience--for their own health, and for the long-term health of this planet.

Before I offer you a few things that come to mind for me . . . let me share one perspective of a friend from Colorado. This is a song of John Denver's. It is called, It's About Time. I would also like to thank Bob Samples and Terry Wilson for their assistance with this presentation.

One earth. We live on one earth. Many scientists think its crust solidified about four and one-half billion years ago, and today it's home to more than four and one-half billion people. Projections indicate that it will be home to more than six billion people by the year 2000. The planet today is also home to an estimated 1,500,000 different kinds of animals and plants. One earth--and it is home to people, plants, and animals of varying kinds and numbers--each connected to every other, either directly or indirectly. Each has similar fundamental survival needs. Each depends on a healthy living planet. Some of you have heard me say this before, but I firmly believe that if people all over this planet remembered--truly remembered--our fundamental connections to all other life forms, we would not allow ourselves to get polarized and fragmented by disputes and animosities among human beings. Politics of war, racism, and aggression among human beings would be seen to make no sense. To the extent that we recognize our connections and similarities with all other forms of life, we can live as people of this planet in harmony. One of the challenges and opportunities we have as advocates of what I call earth-based education is to rebuild those connections. As we reconnect with the earth itself, we strengthen our bonds with the people of the planet as well. We help to heal polarizing fears and, in the words of a phrase being used by many today, we can "give peace a chance" in the context of a living base. We begin with life itself.

Back to the question I asked you, about what you want young people to know and to experience for their own health and for the long-term health of this planet--here are a few things that come to mind for me.

I want young people to know our home is a living earth--a home that we share with people of widely diverse cultural experiences and physical settings--as much home to the humans, plants, domestic and wild animals of South Africa as it is to those in China and India and the Netherlands and the Yukon and Honduras--a home that transcends the blue lines of maps and the flags of nations.

I want young people to experience how the living world works--to get outside, breathe the magic of living skies, and share, as Margaret Mead and Rachel Carson and others before us have said, "a sense of wonder."

I want young people to know they can make a difference--that each day we make choices and take actions from small to large that can improve our lives and the lives of others--and, conversely, can have negative consequences--so we need to pay attention to our actions.

I want young people to experience personal dignity, fairness, and justice--extending this experience to themselves, to other humans, and to other elements of this living earth we call home.

I want young people to recognize that learning is life-long.

I want young people and learners of any age to experience joy, laughter, honesty, integrity, sincerity, creativity, commitment, compassion, and ultimately responsibility . . . from person to planet and back again to person, to each of us individually as a part of a personal cycle of life and learning that helps to conserve and protect the qualities of ongoing life and health and beauty for generations to come. Concern for generations to come is not to be species-centric. Rather, we have a responsibility to all other life forms as well--not that we can always make a difference, but that we do have to maintain a clear sense of our responsibilities for the consequences of our actions.

With that as a small sampling of my concerns and my biases--and you with a sense of those you hold most dear--let me turn to some practical applications. What are we doing as educators within and about the environment--and what else can we do?

I would like to suggest that we need to continue to proceed actively and enthusiastically with what we call an infused or integrated approach to education about the environment. An infused approach is one whereby concepts, skills, attitudes, and experiences related to the environment are integrated within the mainstream school curricula--showing up in every major school subject and skill area, like social studies, science, language arts, mathematics, physical education, and the arts. An infused approach, by my definition, does not preclude nor prevent specialized courses of study or units directly related to environmental topics showing up in the curricula. We can have courses in environmental problems, wildlife, forestry; minicourses on pollution, acid rain, endangered species; and units on a range of environmental topics. However, an infused approach is based on a belief that concepts related to the environment provide an overriding, overall framework and are an appropriate part of every major area of the curricula--in fact, are a necessary approach to every major area of the curricula in order to nurture informed and responsible citizens for a healthy and peaceful planet earth, now and in the future.

I am certainly aware of some of the risks. Chuck Hopkins of Toronto has cited a confusion that can arise with such an approach, suggesting that "What's looked after by everyone is looked after by no one." I share that concern, but believe the risks to be surmountable. I therefore believe philosophically in an infused approach. I also believe it is a realistic approach, given the characteristics of contemporary schooling. As one form, one tool, for an infused approach, I completely and enthusiastically support what has been called an activities-oriented approach to environmental education. I do not think environmental education is a mission gone astray. Let me explain.

Programs like Project Learning Tree, the CLASS Project, Project WILD, and Iowa's OUTLOOK program take an activities-oriented approach to assisting teachers. We offer a variety of instructional activities, from which teachers may pick and choose. The activities are intentionally designed so that they can be integrated within existing curricula. That is, the activities teach concepts and skills that are already a part of the local or state recommended courses of study. These programs can be used as the basis for courses of study, and sometimes they are. They can be used as the basis for developing instructional units which are integrated within the existing curricula, and frequently that is how they are used. Even more frequently, teachers simply select one or two or more than 50 activities during any school year, and include those activities within existing units and courses which they have already developed. That is the real world of teachers. Such an approach may appear to be piecemeal. We worry that we may not be having an impact. The results are beginning to show that we are having an impact--even though I will also quickly say, again, that we have a long, long way to go. For example, our research indicates that where a teacher uses seven or more Project WILD activities of 30 minutes or longer in duration during a school year, statistically significant student learning takes place. Even more important, educationally significant student learning takes place. Although our data are specific to Project WILD, I suspect that similar findings could be identified through use of similarly designed instructional activities and programs. Our research also indicates--consistent with common sense--that the more instructional activities a teacher uses, the greater gain in student learning takes place.

Let me translate these findings into five specific recommendations for some of our continuing work with teachers of kindergarten through high school age young people:

1. I recommend that we keep supporting an infused and integrated approach to environmental education. That simply means, in my judgement, that we keep providing teachers with means to teach concepts, skills, attitudes, and behaviors related to being and becoming responsible environmental citizens as a part of teachers' day-to-day teaching. We keep providing materials and strategies for teachers' use as a part of their social studies, science, language arts, mathematics, arts, and other instructional areas. This does not mean that's all we do. We need multiple strategies. We need to opt for diversity. But the overriding framework--the thread of continuity--is an infused approach.

2. I recommend that we keep providing tailor-made tools for such infusion. That means that we need to keep taking the time and trouble to correlate our environmental education resources with such things as state and local-level minimum competencies and guidelines, as well as textbooks

for science, social studies, language arts, mathematics and other curricular areas. Such correlations make it immediately evident to school administrators and others that when teachers are using these environmental education materials, they are also simultaneously teaching for the local and state requirements in the academic areas.

3. I recommend that we keep providing workshops for teachers as well as other professional development opportunities. Ideally these are voluntarily attended, not required. Preservice and inservice programs for teachers are essential for a variety of reasons. Three examples: they provide additional background for teachers; they provide time and tools for actually integrating this earth-based perspective within the curricula; and they are or can be a great morale boost. Ah, there are other people out there who care about some of these things, and besides that, it's good education!

4. I recommend that we let people know that good environmental education is good education. It's based on sound principles of teaching and learning. It nourishes and supports whole learners. What are some of the obvious characteristics of such whole-earth instruction? It makes use of diverse instructional strategies. We see hands-on experiences, outdoors and indoors. We see some delivery of information in a concise "lecture" format, but an inconsequential percentage contrasted with typical secondary school and college instruction today. It's okay for classroom teachers and students to make some use of a textbook approach--but nothing like the 90-percent dependency which is characteristic of most classroom-based education today. We see small groups and large groups, discussion and debate. We see varied visual approaches, not just verbal. We see whole body activity, not just mouths moving when asked to respond to questions. Environmental education is characterized by diverse instructional strategies--so none of this is surprising. What we need to do a better job about, however, is reminding people that these strategies are characteristics of good science instruction, good social studies instruction, good language arts instruction, and good education overall. The dominant advantage of environmental education is that its ultimate source is just a door away--a door that leads to the first classroom, outside. Thus, environmental education becomes a way to improve teaching and learning through out school instructional programs. We have more to offer than concepts and skills. We have powerful tools for effective instruction as well.

5. I recommend that we do everything in our power to move from "piece-meal to pervasive." I do want to see whole schools and whole school districts actually taking a systematic and thoughtful approach to integrating earth-based education throughout their curricula. I want children to experience such an education at every grade level--not just occasionally from a gifted primary teacher, or an enthusiastic fourth grade teacher, or from a rare high school teacher. But even piece-meal makes a difference. Any time, at any age, people can acquire new insights, real knowledge, new skills, and experience which will in fact translate into changes in their own lives and constructive actions for the planet.

Most of my comments have focused today on mainstream educational systems. As an aside, I want it to be clear that I commend and encourage all of those of you who are working in the area of non-formal education--through nature centers, naturalist programs, scouting and other youth programs, in preschools, and through activities for long-living people, as well as in ways I still have not mentioned. I believe that our approaches must be diverse and they must be simultaneous. We've lots to do to support a developing citizenry who can really sustain and enhance a liveable future for life on this planet, now and in the future.

Earth-based education must begin with the earth itself. Jay Hair mentioned a few days ago that by the year 2000, ninety percent of the people in the U.S. will be living in cities. More than ever, we will have a compelling need to invite people into experiences with the living earth. Education must begin with how the earth works--and then how we as people interact with and affect, both positively and negatively, our earth home . . . from the immediate confines of our home and family to the entirety of our earth home.

Education within and about the environment must begin with the components of life itself. Soils, plants, air, water, animals . . . all the elements of a living earth must be examined and cherished. Such building blocks of understanding are essential before we can tackle what are identified as issues and problems. As soon as something is called an issue, it has been taken out of context. Somehow, people are polarized around it. We as educators within and about the environment have a responsibility to help people put issues back in context--to ground issues again in the living world--so that more informed and responsible decisions and actions can then be made.

To speak of issues reminds me that there is the potential in the area of education within and about the environment for topics to arise which may be controversial. As environmental educators--as educators--I believe we ought not to avoid or reject topics of potential controversy. We do, however, have a genuine responsibility to make every effort to create and maintain a climate of fairness and balance in the process of education. That, in my judgement, is what true education is all about. Sometimes, in that process, topics of controversy may arise. If and when that happens, we need to provide young people and their teachers with access to a representative and balanced range of views and perspectives. We need to do so carefully--with integrity, honesty, and accuracy--advocating no one point of view, but supporting a process of learning about views in order to come to one's own informed judgement. I have learned through a series of events and circumstances during this past year that when topics of controversy arise, everyone seems to think he or she is in the middle. One person's balance seems to be another person's bias. It is not easy. The bottom line, however, for us I think, is that we in environmental education cannot shirk our responsibilities. We must acknowledge that some topics of genuine concern and importance will sometimes be greeted as controversial, that equally earnest and thoughtful people may sincerely differ and disagree as to what is ethical and appropriate. What we as educators must do then is our very best to ensure that the process of education is grounded in quality, balance, and fairness. I believe it is our responsibility--as stewards of the process of education, as well as guardians of our actions to sustain a living earth.

We've a long way to go, and yet I sincerely believe that significant progress toward a sustainable future of quality and health has been and is being made. Brown pelicans and peregrine falcons return to the skies, Puget Sound and the San Francisco Bay have improved in overall quality and health in the last 15 years, certification and curricular requirements in environmental education appeared in Minnesota and Wisconsin recently, as well as other states, and the public opinion polls consistently show a deeply-rooted concern for the environment and its quality as an integral part of the North American psyche, and, manifested in this conference--a world psyche.

So keep up the good work that each of you is doing in your own personal way. Every effort matters. Some is public, most is not. Remain confident and concerned--committed and yet creative--flexible as well as focused--persistent and still passionate. Maintain your own individuality and integrity, even as you are part of this larger earth family and home.

Thank you.

General Session IX: October 1, 1985, 1:00 p.m.

Yvon Dube, Forest Engineer, Assistant Director General,
Department of Recreation, Fish and Game, Province of Quebec.

The Right to a Healthy Environment (Translated from the original French)

When my father was born, there were no cars, no planes, and almost no industrial chemistry. My father Rosaire grew up beside the little Senescoupe River, which skirted the family farm in Saint-Hubert, Temiscouata county. The waters of the stream were pure. The neighboring forests were immense, healthy and well-stocked with game. In Quebec in those days, no one spoke of pollution, ecology or, less still, the environment. Life was good: the farmers' daily, heavy tasks did not dim their enjoyment. They had faith in the future. Nonetheless, there was a shadow on the horizon: the destruction of the pine forests to the west.

About fifty years ago, in the same county, it was my turn to hear the baptismal bells ringing. It was in the village of Cabano, on beautiful Lake Temiscouata. The town had a small sawmill that handled only large trees. There was no clear-cutting. The forest was always mature and healthy. The people were simple and proud of their land. But alas! We were already starting to dream of more powerful cars, bigger plants, and large industrial cities.

Society thus became organized and, in due course, the bulldozer, one could say, was elected to the corporate board of directors. Workers' terms of employment required simply that they be docile and available. The rights of Nature, like those of farmers and native peoples, were forgotten. Gradually, cities were seen as the gardens and oases of society. Everything else became as folklore, relics of things past. It was a time of industrial expansion. Even artisans lost their souls to it. Then, suddenly, great events on a global scale altered the course of history.

Industrialization

There were Hitler and Stalin, Churchill and Roosevelt, de Gaulle and Gandhi. A new world was born, and with it, new hope based on fraternity and the advances of science and technology. The League of Nations was replaced by the United Nations. We spoke of liberty, but wars raged on, and colonialism and imperialism took advantage of these to assume new identities: multinationalism, aid, development, alliance, and reciprocity. Money was power. New members were elected to the corporate board of directors: productivity, economy of scale, and profit at any price joined the bulldozer. We saw no necessary connection, at the time, between ethics and development.

In this new era of technology and industrial frenzy, the "uneducated" learned to count, forgetting history, geography, and biology. Nature was manipulated with more vigour than ever, without a thought being given to the consequences. We built, dug, destroyed, invented, polluted, while the oppressed waited their turn--or the right moment. The human species poisoned its own daily bread. Faust no longer toiled alone in his laboratory.

Pollution

Then came my children's turn. They were born to a society that was dazed by a welter of changing values, and where domination and subservience too often had the upper hand. As never before, we built on sand and drudgery. The more cynical preferred drudgery--it was more stable--drudgery and despoliation of the very land itself. It was that, in particular, that was new. Dollars grew out of waste and poison. We pretended not to notice. It is difficult to believe that our society could have succeeded in doing so much damage in such a short time. Fifteen years ago, it was calculated that the activities of our civilization have caused more damage than those of the entire preceding millennium. "And did no one do anything to stop it?" my grandchildren will ask. Will I pretend not to hear? No, I will take the time to explain how destructive forces were able to lay a curse on our heritage and how, in response to this, ecologists succeeded in shifting the course of industrialization.

At present, we are still in turmoil, and there are thousands of documents to prove it. Nature is tired. Nearly all of our forests are in bad shape or depleted. Even the oceans are polluted. Soon, humankind will also be tired. Our way of life will crumble if we continue to ignore the omens of our decline. In the past, canaries were used to detect deadly gases in coal mines. Today, in our open-pit "mines," plants, animals, forests, and even people serve as detectors. And at what a price!

Society's Reaction

We are not yet fixed on an irreversible course that will end in chaos, but one almost feels that the earth itself is beginning to react in fright. People and animals all sense the need for clean air and pure water. Are we going to ask our bankers and economists to defuse the ecological bombs that are rolling around at our feet? Are we going to wait passively for governments to reason with those who perpetrate environmental destruction? Can we count on the courage and social consciousness of the heads of large polluting industries?

Present indicators are not so rosy, despite some prudent corrective measures that are being taken here and there. We still commission far too many detailed studies to camouflage the irrefutable, damaging evidence, or to justify unpardonable indecision. In light of all this, do we have the right to speak out? One thing is certain, we have the right to know. And those who know must speak. Those who have a way with words must explain. It is up to all of us to do something.

Whether we live in fashionable neighborhoods or slums, nothing valid or lasting will be achieved unless all of us rouse ourselves and act with awareness and determination. In my opinion, that is what we are doing in this democratic way, here in Chevy Chase, at the 1985 Annual Conference of the North American Association for Environmental Education. This is not war: it is an exercise of our rights. It is the extension of knowledge about environmental rights, the right to health, the health of nature, the health of humankind. This year, 1985, is International Youth Year. The finest gesture we could make would be to show greater environmental respect for the sake of our children. We do not have the right to take away their birthright. The year 1985 is also the International Year of the Forest, as declared by the Food and Agriculture Organization of the United Nations. Forest conservation is closely related to our environmental rights and is a particularly valuable lifeline for all those who are concerned about the fate of humanity. We cannot borrow too heavily against the future.

Public Awareness

The theme of this conference is Progress Toward a Sustainable Future. We are neither industry nor government; we cannot act directly or forcefully. However, public information is one of the most effective means we have to restore the biological balance of the continents and the health of the oceans. Accurate information is like a wave given impetus by courage. Polluters cannot resist such a force indefinitely.

It is through the efforts of our devoted teachers, honest researchers, conscientious journalists and people with plain common sense that we can hope for an ecological recovery. Thanks to nonconformist writers who have not accepted the false gods of a materialistic society--like the American trailblazer, Jack Kerouac, who made it his duty to preach universal goodness and respect for our surroundings--society can hope to restore its balance. Progress has been made. Society is becoming increasingly aware of the environment. But not quickly enough. We must meet the attacks with more vigour, and we must not allow our successes to lull us into laziness and inaction.

Reluctance of Governments

The world's principal economic and financial systems are not being geared to fulfilling the aspirations of those who believe first and foremost in respect for life and for the human person. People are feeling betrayed, and are gradually losing faith. Meanwhile, our society continues to deal nature harsh blows. Leaders are trying to ignore the most vociferous critics. Few people realize the seriousness of the biological disturbances that are accumulating. In reality, many hold back, and may even compromise at the expense of health and of life itself.

Virtually all countries would like to grow and develop. Curiously, however, far too many are willing to commit all sorts of environmental atrocities to reach their goals. We try to block out the fact that a nation's long-term prosperity must be based on the health of its people and of its environment. In the long run, a weak population and an unhealthy environment do not benefit anyone except, perhaps--and only temporarily--those who exploit property. Moreover, a country's health depends on the health of its local communities and the dynamism of its regions, to which maximum autonomy and self-sufficiency must be given if nature is to be respected. It is this economic self-sufficiency and prosperity, enhanced by the efforts of free and enterprising individuals, that ensure the independence of a country. The quality of life and the wealth of a nation generally go hand in hand. The Gross National Product is not the only indicator by which they may be judged. Respect for fundamental rights is equally important.

Human Rights

I would like to speak briefly of fundamental human rights. Aside from rare exceptions, the first notable statement of rights appeared in the abjuration act of the newly-founded Dutch republic in 1581. In declaring themselves absolved from allegiance to Philip II of Spain, the Dutch said that God did not create subjects for the benefit of the Prince, but the Prince for the benefit of the subjects, without whom there would be no Prince. Two hundred years later, in 1776, the United States Declaration of Independence went further. Then, in 1789, France adopted the Declaration of the Rights of Man and of the Citizen, stating that "all men are born free and equal in rights." There were many other equally noble gestures, but it was not until 1948 that the most important declaration of our time, the Universal Declaration of Human Rights, was laid before the people of the world. Unanimously adopted by the United Nations General Assembly, this Declaration states that "all human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood." We only need to think of the acid rain phenomenon, and the word "brotherhood" immediately takes on an ecological dimension. The Declaration also stipulates that "everyone has the right to life, liberty and the security of person" and that "everyone has duties to the community in which alone the free and full development of his personality is possible." Rights, duties, responsibilities. Is it possible to be ourselves, free, open, helpful to others if, at the same time, we vie with one another to do violence to nature?

Ecologists

Environmental protection and ecologists' movements find their moral base and political justification in the Universal Declaration of Human Rights. They draw their strength from all similar texts found throughout the world, in addition to natural law and the basic rules of life in society. Human beings do not join forces with other human beings to be worse than before. Fortunately, there are thousands of statutes and regulations that we could invoke to ensure that the health of the environment in which we live is respected. We must not forget that there are millions of people worldwide whose subsistence economies depend directly on the health of their living environment. Industrialists who refuse to respect these ecosystems violate moral law.

In a country that respects and subscribes to the United Nations International Covenant on Economic, Social and Cultural Rights, adopted in 1976, the right to life is not limited to the right to existence. It includes the right to health and even a right to take action against those who undermine this right. It also includes the right to the quality of life. No government has the right to suppress or oppose those who strive to improve conditions that permit an existence more respectful of their environment. On the contrary, governments have a duty to support citizens who have the courage to attempt to reverse the trend, to swim against the stream, and to build a society based on fundamental ecological values. Federal governments have a duty to support provincial or state governments, and regional and local authorities have the right to achieve the degree of ecological excellence to which they aspire. Citizens must, of course, pull their weight. In short, excessive anthropocentrism must give way to a biocentrism that is balanced by a respect for all life.

Agriculture

I would like to take a closer look at agricultural practices that have ongoing physiological effects. Single-crop farming, chemical fertilizers, pesticides, heavy machinery, intensive animal husbandry, gigantism, overrefining, preservatives, colouring, and so on are distinctive features of modern agriculture in North America and elsewhere in the world where North American influence and aid are accepted. Such highly mechanized agriculture degrades and compacts the soil, removes the humus, increases erosion, adulterates foods, undermines physical and mental health, destroys family agriculture and the values associated with it, promotes concentration of ownership and power, increases bankruptcy and unemployment, relegates farmers to the ranks of low-paid labour, accelerates the pace of life in the country--all in the name of efficiency, prevailing economic theory, financial gain, and all the new idols of "development" at any price, even if that price includes social alienation.

The following is an extract from Adelle Davis' book, *Let's Eat Right to Keep Fit*:

> Most of the murders and vicious crimes in this country are being committed by schizophrenics. Suicide, a major cause of death among college students, is extremely high among schizophrenics, yet has dropped to zero in groups given large amounts of niacin amide. It will someday be recognized that our disgraceful crime rate, our tremendous loss from suicides, and our millions of alcoholics are in part brought on by food industries which, ignoring health, flood the market with overrefined and overprocessed products designed merely to make money.

In an eloquent discussion paper on the hopes and challenges of agriculture in Quebec today, written in 1985 by the Bishop of Amos, Gerard Drainville, a biologist, the Quebec assembly of bishops made the following statement:

> To promote food self-sufficiency of countries and regions is to run counter to the current trend of market economies, which are eager to keep others in a permanent state of dependence and even to create new dependencies. Those who promote centralization will not fail to denounce this autonomy as a step backward. It is more the rediscovery of the first principle of true development based on respect for the rules of nature and on autonomy and complementarity of people and regions, as opposed to domination and dependence. It is the difference between maintaining Third-World anomalies and assisting people and populations to achieve harmony, solidarity, and equality in dignity.

Industry

I would like to turn, for a moment, to large-scale industry. With all its blessings and merits, it has acquired over the years a certain stature, which is now clearly diminishing. One could say in general that, by polluting the environment, major industry carelessly and cynically alters the nature of water, air, soil, vegetation and humankind itself--in the name of profit, competition, and corporate survival. In addition to the "corporate bums" in our society, there are far too many industries that claim they do not have enough money to combat pollution or to use new non-polluting processes. Moreover, they manage to obtain government assistance, through subsidies and other concessions, which could be directed toward those industries and organizations that show greater respect for the environment and offer more substantial benefits to society. Let us hope that one day, in the near future, artisans and small business operators, including those in the agroforestry sector, will break through the current preoccupation with "bigness" and demonstrate the innumerable and enviable qualities of their particular way of life.

Cities

How do we view the growing ghettos of underprivileged and unemployed people who take refuge today in and around our cities? In major urban areas, where development is uncontrolled, we see problems of overcrowding, traffic, crime, pollution, and health. Few people, in fact, actually oppose the proliferation and overpopulation of these explosive centres. We study, and we hem and haw. Green spaces are paved. Neighborhoods are added like the closely-placed annual rings of a tree. Problems are compounded. We place too much faith in the virtues of a technology to which we irresponsibly entrust the task of resolving problems which are really a question of human dignity. When I was a member of the 4-H Club in Cabano, the parish priest, Jean-Philippe Cyr, used to say: "Do your own thing, but do it." We cannot solve problems by simply watching them grow, as we are currently doing in most of the world's major cities. It is true that there are very costly economic reasons for our doing so. However, being here at the National 4-H Center in Washington, D.C., has reminded me that the philosophy of the 4-H clubs emphasizes clear-thinking and candour--two qualities essential to urban planning and environmental protection. I am sure that 4-H Club members of today, and other young people as well, have many things to teach us--including the satisfactions of community service in causes that transcend the concerns of individual daily life.

Acid Rain and the Rest

In addition to major agricultural problems, excessive industrialization and unplanned urbanization, we cannot pass over in silence the ravages of acid rain, land desertification, the degeneration and elimination of forests, the destruction of the ozone layer, the extinction of animal and plant species, the devastation of critical faunal habitats, and so on. The natural environment is losing the battle, and the victors will have nothing to celebrate except the ruins and failures of their victories. Some cynical souls claim that we must not restore ecological equilibrium too quickly, because the economic and financial systems that depend on the status quo would then collapse. We have a choice between ruinous prosperity and intelligent frugality. But to create waste on that scale is not very honourable. If that is the best we can do, we had better refrain.

The Stockholm Conference

The right to a healthy environment took on worldwide importance at the United Nations Conference on the Human Environment, held in Stockholm, Sweden, in 1972. The conference laid down the following principle:

> Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations.

Following this conference, Spain, Portugal, Peru, Poland, Hungary, Yugoslavia and a number of American States incorporated environmental rights into their constitutions. Other countries adopted general environmental protection legislation. Many others have laws that protect certain elements of the environment. The World Conservation Strategy, published in 1980, proposes that environmental protection be integrated with development. A giant step forward was taken on October 28, 1982, when the United Nations General Assembly adopted and solemnly proclaimed the World Charter for Nature.

Some Rights of Society

Citizens have the right to parks, wildlife reserves, sanctuaries, ecological reserves, marine parks, and so on. The Canadian Committee for the UNESCO Man and the Biosphere (MAB) Programme, which is involved in coastal development, land management, and environmental education, also deals with the establishment of biosphere reserves. Parks and reserves, as other protected areas, are like the Crown jewels. It would be a black day if they were given up to plunder in return for a few immediate economic benefits.

We have the right to free universities that teach ecological agriculture, as well as dehumanizing and polluting agriculture; that advocate ecological silviculture more than wasteful forestry; that teach the art of living, as well as all-powerful science.

We have the right to well-managed forests, safe from chemical attack, clear-cutting, acid rain and huge machines. We have the right to the sustained yield of forests and of all the components of this vast biological community--including wildlife, landscapes, pure water, and tranquillity.

We have the right to governments and industries which do not mortgage the future. We no longer have the right to pass on the bill to our children--if we ever did have that right! Our young people have the right to living lakes, edible fish, and healthy salmon rivers.

A Montagnais woman from the village of Natashquan on the north shore of the St. Lawrence River said to me a few months ago that it would be our fault if one day there were no longer enough fish in their river! The acid rain map of Quebec, published in 1984 by the Societe pour vaincre la pollution, shows that she has reason to be concerned, though the Natashquan River is far away from our factories. North of the easternmost tip of remote Anticosti Island, Natashquan is not even connected by road to the industrial centres of the province.

Self-Sufficiency and Internationalism

Every country has at least four important economic levels:International, national, regional, and local. Like a living cell, each of these four socioeconomic units generates closed-circuit activities and external exchange activities. Exchanges are generally most significant in human terms at the regional level, where the feeling of belonging is strongest. This is impossible to ignore. It follows that all governments must rigorously respect the cultural and social values that are inherent to the regions. Senior governments, therefore, do not have the right to determine the way of life that is right for the regions.

Regions that put their faith and interests in the hands of higher authorities and do not try to control their socioeconomic and political activity quickly become the prey of tentacular organizations. The responsibilities and difficulties that come with autonomy are weighty ones, however. A cell can rely on outside support and reduce its internal activities to a bare minimum, but it thus becomes subordinate and dependent. The same is true in our societies. The weaknesses of regions do not benefit the country as a whole, but may benefit the forces that control the regions, thus opening the door to submissiveness, to the infringement of environmental rights, and to pollution.

Normally, greater local and regional autonomy and self-sufficiency diminish energy costs--transportation being the best example--and pollution, because production levels and manufacturing processes are carried out on a human scale and there is a natural recycling of resources. The most important element of an autarchic policy affecting local communities is flexibility and the constant possibility of strategic withdrawal when the highest levels of authority are in a state of crisis. This reduces dependence, but does not prevent external relations. On the contrary. The greater the health of the regions, the more able they are to participate in international activities which do not undermine their environment. They are in a strong position to negotiate and can preserve their quality of life. They determine their growth rate and select only those industries and occupations that are compatible with respect for nature and for life.

Consequently, it is extremely important that countries accurately measure the volume of their activities and exchanges at each economic level, to avoid dependence and the risk of destruction of the ecosystems that are their most valuable resource. Between local and regional subsistence economies at one end of the spectrum, and extreme internationalism and imperialism at the other, neither of which can be defended here, there is intelligent awareness and controlled balance.

Lasting interdependence is a myth, as is absolute freedom. U Thant, former Secretary-General of the United Nations, used to say that there was no such thing as a permanent friend or a permanent enemy, but only permanent interests. Nevertheless, there are limits that must be respected. There are requirements and tolerances beyond which we cannot go. No region or country should be forced to destroy its natural resources and offend the dignity of its citizens to satisfy either the over-indulgence of dependence, or the excesses of independence. The apparent affluence of those who are the victims of pollution and the apparent freedom of the underprivileged are too often praised by those who exploit them.

A Biological Consciousness

If citizens are to have their say on the protection of the environment and the preservation of the collective heritage, they must develop an awareness of geobiology. They must be conscious of and fully knowledgeable about the natural environment surrounding them. Before inhabiting a country, we inhabit a river valley or a drainage basin, we till a calcareous soil that is stirred by a westerly wind, and so on. The water that we pollute continues to flow. It becomes somebody else's water, until it reaches everybody's ocean. How many of us can name all of the river basins upstream and downstream from us? A greater awareness of hydrography should be promoted in the home and at elementary school. This also hold true for the air that we inherit from somewhere and that we pass on to others who do not have the option to refuse it. A greater awareness of prevailing wind patterns would be useful to those who live downwind from polluting industries. Our awareness of forestry must be awakened as well. Temperate-zone forests are exploited without adequate planning, and tropical forests continue to disappear as a result of the adverse effects of organized industrialization, swidden cultivation, and a host of economic and social injustices.

Resources and Heritage

If we gave it the slightest thought, we would realize that the world's natural resources are collective property that no one should have the right to misuse. Without the development of a public awareness of ecology, there is little hope of halting the destruction of this heritage. Without strong, tightly-knit socioeconomic networks at the local and regional levels, complemented by larger networks more heedful of local needs, there will be continued indifference and risk of devastation.

In the foreword to the World Conservation Strategy, Indira Gandhi eloquently stated:

> I do not cease to marvel at the multi-faceted beauty of the earth and the remarkable achievements of human endeavour. But I am astounded that human beings should allow their vision to be so clouded by greed for profit or other selfish motives or even by false notions of national pride as to be imprisoned by the immediate here and now. What would our earth be like without the forest left uncut and the trees planted by those who went before us? . . . We must enable the earth to renew itself. We must aim to improve the material, intellectual and spiritual circumstances of people.

People tell me that such speeches achieve nothing and that they are like mere drops of water in a desert. On the contrary, in my view, they fire the inner flame of a psychological revolution. They spur the more courageous among us to participate, even in our modest way, in building the foundations of a renewed society. We must repeat such messages without losing heart, state and restate the same thing differently, for, as our teachers can tell us, the message and the audience are never the same. Each occasion brings something unique: a new challenge, a new response.

Joy of Living and Cultural Respect

Fifteen years ago, the President of Zaire, Mobutu Sese Seko, spoke about the dignity of people, the pride of being master in one's own house, the joy of living in a liberated country, the satisfaction of building and developing a society in accordance with one's own customs, at one's own pace, and with the means at hand. He spoke, among other things, of Gross National Happiness. In 1985, at the Universite du Quebec a Chicoutimi, a group of geography students attempted to evaluate the human dynamics, economic values, and social qualities of each of the regions of Quebec by measuring their Gross National Happiness. The Gaspe peninsula won, despite the high unemployment rate and the relatively low personal incomes of its people. But Gaspesie has the ocean and the mountains, and a population possessing great pride and nobility, resourcefulness and humour, and "joie de vivre." Obviously, we need to explore further the concepts of happiness and well-being. We would surely discover that they include pursuit of the simple life, and with it a respect for ecology.

The Amerindians and the Unuit of northern Canada demand their place in the sun, recognition of their cultures, and protection of their environment. This does not make them incurable utopians or diehard dreamers. They prefer the right to live their own life to the right to a guaranteed job in a system they consider repressive. The Maoris of New Zealand believe that the earth is a spiritual and cultural resource that cannot be treated as a commodity in the marketplace. All claim the right not to be subjected to pollution, in the same way that they would not pollute the environment themselves. At the philosophical level, they go beyond the class action methods that some countries such as Brazil (notwithstanding its excesses of centralization) make available to those who feel their environmental rights have been infringed: they demand respect for their cultures and their environment.

A Ministry of Land

A government that does not wish to protect the environment merely by rearguard action or step-by-step measures must go beyond a department of the environment, however well organized and powerful it may be. Even if such a department succeeded in reducing pollution, preventing waste, recycling waste, and countering the misuse of resources, there would still be fundamental shortcomings related to the allocation and use of land. It is not the responsibility of the environment department to remedy the structural defects in government apparatus. In this case, it is a territorial duty related to cadastral survey, land ownership, and land use planning. This is the work of a ministry of land.

In my opinion, such a ministry is an obvious necessity if we wish to resolve many environmental degradation problems at the source. It should not be left to the department of agriculture, for example, to decide to drain swamps or wetlands rather than maintain them as essential wildlife habitats. It should not be left to the department of forestry to cut down all the trees in a heronry or a yard of white-tailed deer on the assumption that these animals could always live elsewhere. It should not be left to the department of highways to decide to build a highway right through a string of family farms rather than build it a little further away at the foot of a mountain. It should not be left to the department of municipal affairs to expand a city at the expense of a regional park or an agricultural terrace. It should not be left to land surveyors to survey and register everything in straight lines, when the topography, hydrography, and geomorphology of the land demand a little more imagination. The examples are endless. No such department or interest has the right to be the sole decisionmaker in these matters.

It is surprising that, after so many agricultural, forestry, faunal, hydrological and other misfortunes, the most important of all the natural resources of a country--the territory, or the land itself--is not given more consideration. Sound basic cartography, proper surveys, integrated resource inventories, polygeometric surveying and registering, simplified regional management schemes based on harmonized sectorial management plans, flexible development plans that respect the land and the people of the region, land use plans that are compatible with nature--these would be the framework of a ministry of land. Environmental protection would be achieved largely a priori by such a body.

Land that has been well-mapped, well-surveyed and well-planned is already partially protected against physical degradation. For example, during the 1977 U.S. drought, there were clouds of dust over Texas but not over New Mexico, where land use is more rigorously planned and controlled. Perhaps the sandstorm of June 8, 1985, in Manitoba would have caused less damage had there been more windbreaks, fallow bush, crop diversity, multiple-use pasture land, and so on.

A ministry of land, including a boundary office, is much more easily justified than many other departments that deal with less fundamental issues. The sixteenth principle of the World Charter for Nature reads as follows:

> All planning shall include, among its essential elements, the formulation of strategies for the conservation of nature, the establishment of inventories of ecosystems and assessments of the effects on nature of proposed policies and activities; all of these elements shall be disclosed to the public by appropriate means in time to permit effective consultation and participation.

We often think that everything has already been said about pollution. Clearly, not everything has been done.

Information, and Cleaning up Our Act

Many countries want to eleminate pollution, restore their resources, and regain their self-respect. They must begin by publishing the facts. In early 1985, in the magazine India Today of New Delhi, Suman Dubey stated that the important thing to remember is that India has a free press, a rarity in southern Asia, and that with accurate information, society is changing, irrespective of politics. I invite you to draw the necessary parallel with the environment, because each new code of ethics raises the opposition of those who place their personal interests above all else. It takes more courage to stop lying to ourselves than to build on our most optimistic dreams. We must not exchange the challenges of the fight for the relief of resignation, or the monotony of indifference.

On the subject of one of our most frightening pollution problems, acid rain, we have only to reflect on the recent words of Robert Baboian, Director of the Texas Instruments laboratories in Attleboro, Massachusetts. During a visit to Montreal this summer, Baboian estimated that acid rain caused $50 billion in damage annually in the United States, and explained that chemical acids attack concrete, limestone, marble, brick, and stucco, as well as metal, wood, cotton, paint, and plastic. The damages caused to cultural and historical monuments cannot even be estimated in dollars. The figure of $50 billion includes only structural damage caused by acid rain. If we include water, pure air, health, forests, maple groves, and so on, we would be truly staggered by the extent of the disaster. And to think that there are still skeptics who think these concerns are exaggerated!

Fortunately, in North America, there are thousands of groups and organizations engaged in many types of community efforts. They do their work, correct errors and shortcomings, encourage governments to be more democratic, assert their viewpoints, and promote common interests. There are those who deal with environmental justice by demanding more respect and more integrity. They combat pollution by identifying and denouncing the causes of the more urgent problems. We must join them in acquiring knowledge and disseminating it, understanding environmental protection and teaching it, respecting others' rights and asking as much in return. We should demand what belongs to us: a healthy land.

Summary and Conclusions

I have noted that widespread pollution is a contemporary problem, and have proposed that people hasten to claim their right to a healthy environment, which is one of many human and natural rights, and that we concentrate particularly on agriculture, industry and cities. More regional autonomy and self-sufficiency would, I believe, reduce dependence and lessen the dangers of pollution that accompany subservience to a higher-level authority. I have proposed that each province or state create a ministry of land to remedy, at the source, degradation caused by poor land use. And I have stressed the importance of public information as the most valuable democratic tool we have in fostering respect for nature and for life in general.

We have seen that citizens' rights to clean water, pure air, and wholesome food is as fundamental as those rights proclaimed by the Charter of Human Rights and the World Charter for Nature; that governments have an obligation to invest in the quality of life and health rather than subsidize polluters; and that environmental justice is a stage of civilization that we will reach through respect for life and through public information. The evidence of a century of organized pollution and disastrous prosperity should suffice.

To conclude, I would like to say that humanity is behaving as if in a bad dream in its attempt to move toward a civilization of respect for all life. In endeavouring to nourish our ambitions in the light of social consciousness, we have a duty to cultivate the fallow land of our unconscious, to root out our contradictions, and to cleanse the wastes of our opulence. Our task is to build a world in which people will learn to enjoy greater respect for one another, and to live in communion with nature.

General Session X: October 1, 1985, 7:00 p.m.

Jay D. Hair, Executive Vice President, National Wildlife Federation

The Role of Environmental Education Organizations in Achieving a Sustainable Future

President Lyndon Johnson knew the value of education. "The answer for all our national problems," he said, "the answer for all the problems of the world--comes to a single word. That word is 'education.'"

The urge to educate infuses every current undertaking of the National Wildlife Federation. The full range of our offerings--from our publications and our camps and summits to National Wildlife Week and the CLASS Project--together, they provide environmental education programs for toddlers and grandparents--and every age group in between.

Whether in the classroom, the courtroom, or on Capitol Hill, the National Wildlife Federation educates Americans. Unfortunately, too many corporate executives don't get their first environmental lesson until we meet them in a courtroom. There, they learn only too quickly the environmental lessons that eluded them before.

Although we have come a long way down the rocky road of understanding, the need for creative and effective environmental education has never been greater. A story is told about a truck driver who stopped his rig every two miles or so, got out and threw a big rock against the side of the van. A highway patrolman watched this bizarre behavior over the course of several miles before he finally pulled the driver over to ask for an explanation.

"Buddy," said the patrolman, "you seem to be having a difficult time. What's your problem?"

The driver wiped his brow and sighed, "Well, officer, see, I'm driving a two-ton rig, and I'm hauling four tons of canaries. The fact is, I've got to keep half of 'em in the air at any one time."

I think that pretty well describes today's environmental overload, but unfortunately it's no joking matter. Quite simply, we are overtaxing the Earth's environmental carrying capacity at every juncture.

In recent years, technology has brought forth stunning advances in global communications, medicine, space exploration, and agricultural productivity. Yet, we are not applying our technological superiority to, at least, one important area--to acquiring fundamental ecological information about this planet we live on.

For instance, we know the mean diameter of the Earth is 12,742 kilometers. And we know the mass of an electron is nine point one times ten to the minus 28th power grams. We even know the number of stars in the Milky Way is approximately ten to the eleventh power.

But we don't know one of the most basic measurements crucial to an understanding of our planet. We do not now--not even to the nearest order of magnitude--how many species of organisms there are on Earth. How can we seek systematically to protect our environment and conserve our natural resources when we lack such basic knowledge?

Despite our resolve made on Earth Day fifteen years ago, we today are still consuming the Earth's productive natural resource base at breakneck speed. Our basic global biological systems--forests, grasslands, fisheries, and croplands--are deteriorating or disappearing at a frightening pace, and at a time when our worldwide population is growing.

The idealism and enthusiasm we saw on Earth Day 1970 has not been translated fully enough into action. As a result, the United States, the world's breadbasket and its technological pacesetter, is suffering phenomenal losses every year.

We don't, for instance, see dust clouds blowing out of the Midwest. But, every day, 26 square miles of topsoil are eroded away. More than six *billion* tons of rich topsoil are lost every year. That's enough to fill 300 *million* dump trucks. Three years ago, the Worldwatch Institute estimated that more than a third of the nation's cropland urgently needed special help to combat soil erosion. They haven't received such help--yet. But this year's Farm Bill, with its sodbuster and conservation reserve provisions, are important steps in the right direction.

But soil erosion, and the water pollution that usually accompanies it, are not our only avoidable environmental problem:

- For example, two hundred Americans are born in every *hour* that passes--Americans who will have to be clothed, housed, educated, provided jobs and fed more than 93-thousand meals during their average lifetimes. And as we all now, the most crucial over-population problems are not in North America. We simply must stabilize human population growth worldwide.

- Today in the United States we are generating more than 265 million tons of hazardous wastes each year. That is more than one ton for every man, woman and child.

- In the past two centuries, we converted more than half of America's original body of wetlands to other uses. And we have not stopped. Even today, we are losing more than 300 thousand acres of wetlands each year.

- Three million acres of rural lands are lost annually to non-farm purposes. Of this, almost one million acres of prime agricultural land will be converted to shopping malls, houses, roads, and nearly 200 thousand acres will be covered each year by man-made impoundments.

- The amount of land we are losing each year--the amount of potential wildlife habitat--is dramatic. Imagine a road, one mile wide, covering the three thousand miles from New York City to Los Angeles, and you will have envisioned the amount of land we pave over each year. And no one questions that asphalt is the last product of the land.

I don't want you to interpret this as my woebegone speech. Many of us have a positive vision of our future, a vision far more optimistic. It is a vision of making technology work for us, not rule us. It is a vision that starts with people like you and me working cooperatively with others in our society to ensure a golden future for the generations yet unborn.

It is a vision brightened by hopes and dreams, and one that is within our grasp because Americans are vitally concerned about the environment. In a recent public opinion survey, conducted by the Democratic Senatorial Campaign Committee, voters listed environmental protection as the third most important issue--right behind reduction of wasteful defense spending and a cut in the federal deficit. They put environmental protection above such issues as social security, Medicare, and tax simplification.

They voiced much the same sentiment this past March to pollster Lou Harris, who found that in the environmental area, the dynamic of change has been in one direction: Americans get tougher and tougher, more adamant and more shocked about the state of environmental cleanup.

Looking at those survey findings, we'd almost be tempted to conclude that environmental education has been a smashing success in altering perspectives. And in many ways, environmental education has succeeded. Americans today--indeed, citizens of most developed countries--have strong feelings that environmental protection is crucial, that it is not a luxury. Indeed, in some instances, it is literally a matter of life and death.

But having such feelings is not enough. Too many Americans understand only superficially how and why environmental integrity is essential to the quality of life we cherish. That must change.

And with your help, it can change. The primary role of environmental education must be to help people know the environmental facts, and then to understand the interrelationship between the environment and all other essential components of our society. Without such an understanding, our search for the quality of life will be unending--and fruitless. But, first, how can we define the "quality of life" in such a way that it becomes a realistic vision, rather than an elusive dream? Over the years, I have given the matter considerable thought, and I've concluded the quality of life can be described by three important factors: social, economic, and environmental.

First, in the social arena, we are seeking, for example, quality health-care systems, good public education, low crime rates, and a host of other social amenities.

Second, in the economic arena, we must have jobs for all who can work and equitable wages for all who do work. Not surprisingly, we have found that economic health is closely and probably directly linked to environmental health. In the final analysis, a healthy economy is based on the wise use, not the misuse, of our natural resources.

And thirdly--but most importantly--the quality of life is dependent on the quality of our environment. What good can a first-rate health care system do in a world beset by undrinkable water and unbreatheable air? What kind of economic progress can we expect if we despoil the environment on which our resource-based economy is built?

You will notice, if you take the first letter from each word in those three categories--social, economic, environmental--they form the acronym "SEE." And that is exactly what we as environmental educators must do. We must help others SEE and understand the consequences of their actions rather than just look on the surface of situations before them. All components in our society must SEE that our dreams for a sustainable future are precariously dependent on how well we use and conserve our natural resource base.

Lester Brown, in his book Building a Sustainable Society, correctly observes that the future must be substantially different from the present. To attain a sustainable society, we will need to recognize limits--to understand that population will have to be more or less stable at current levels. Energy will have to be used far more efficiently, and the economy will be fueled largely with renewable sources.

But we have little hope of reaching a sustainable society unless education helps people understand the fundamental interaction between humans and their environment. Although the first and primary role of environmental education must be to teach environmental facts, no educational process is devoid of a value system. If we are to change individual behavior, then we must change individual values and ethics.

As teachers of tomorrow's political and corporate captains, you can help mold the values and ethics of young people. You can help them appreciate the aesthetics of the wilderness and the awesome splendors of nature. You can teach them about the interconnections of all life, and about the values of maintaining environmental integrity.

But you cannot do the job alone. You must begin to form closer alliances with one another, and with appropriate national associations and private sector institutions. Only through such cooperative efforts can we again bring environmental education to the forefront of our society's complex agenda.

Frankly, environmental education today is a step behind its position a decade ago. Although the 1970 federal Environmental Education Act offered only minuscule funding, it did establish a national policy on behalf of environmental education. It sent to state departments of education a clear message to begin developing and integrating environmental curricula into public school programs. Today, that message is not being transmitted aggressively enough. We need to change that.

Although I am not one given to overstating the case, let me suggest that throughout our nation today, environmental education is in a state of crisis. Likewise, let me suggest, that may be an advantageous position. After all, the Chinese ideogram for the word "crisis" is a combination of the symbols for "danger" and "opportunity." The symbolism is apt. For while we have long faced the danger of decreased support for environmental education, at this crisis point we also see the opportunity for growth.

To achieve the field's full potential, we must become activists for change on new frontiers. First, we must gather strength within the legislative chambers of state capitals across the country to bring new vigor and new funding to environmental education. Second, we must work cooperatively with a variety of organizations to create and expand our educational programs and outreach.

I'd like to concentrate for a few moments on each of those areas. The quality and quantity of educational programs varies widely from state to state. Some systems--like California, Wisconsin, Michigan and several others--are innovative, progressive, and highly successful. But, in general, the quality and quantity of environmental education is inconsistent. With the coordinated efforts of state, regional, and national organizations, that no longer needs to be the case. Several states can serve as models for appropriate action.

California, for instance, is one of the few states where environmental education has a dedicated source of funding. There, revenues from the sale of personalized license plates are earmarked for environmental undertakings, including education. As a result, environmental education is moving full steam ahead.

But California doesn't have to be, and shouldn't be, one of the few states with a dedicated source of revenues. You are the key to unlocking state treasuries just as you are the key to unlocking the treasuries of the human mind. You must make the nation's local legislative chambers your next frontier if environmental education is to regain its rightful place on the national agenda. The value of another federal law on behalf of environmental education is questionable. No such question exists about the value of local support for environmental education.

At the same time, you should work aggressively with organizations like the National Wildlife Federation and the National Education Association. Such cooperative efforts will result in higher quality curricula and a far broader acceptance of environmental education. You should enthusiastically support creative new programs, like Project WILD.

But developing high quality educational materials is not enough. Environmental educators for years have written tomes of wonderful materials, only to see them get dusty on the shelf because they haven't been properly marketed. It is important for us to learn some lessons from the nation's business community. We must understand how markets are segmented and how we can target new materials to selected audiences in order to answer specific needs. Then we have to use the most effective promotional techniques to get the materials into the proper hands so the information ultimately winds up where it's supposed to--in the minds of people. My point is: the proper development and marketing of environmental education material is not a casual process. It takes creative, multi-faceted professional skills and coordinated efforts every step of the way.

Finally, environmental educators must be courageous and dynamic leaders in the classroom. We must be willing to stake our reputations and our professionalism on bold educational moves that will exert a positive influence on human behavior.

To inspire and guide us, I'm reminded of President Teddy Roosevelt who said, "Far better it is to dare mighty things, to win glorious triumphs, even though checkered by failure, than to take rank with those who neither enjoy much nor suffer much, because they live in the gray twilight that knows not victory nor defeat."

So it must be with environmentalists and those who are the teachers of our movement. You are among the nation's most taxed and tested, yet you must dare mighty things. Your role is vital. Your talents are essential to the development and implementation of creative and effective environmental education programs.

Indeed, the environmental education agenda confronting us is demanding. We are seeking to instill so many skills in students: We want them to have a conceptual understanding of the man-made environment. We want to enable them to make value judgments about the Earth's order, harmony, and beauty. And we want to teach them how to ask the hard questions about environmental quality in order to find appropriate, balanced solutions.

As I close, let me tell you a story that I think captures the essence of my message. It is a story about a youngster attending his first day of school. Standing on the porch of their rather modest home, the father explains how important this day is. "Son," he says, "today is your first day of school and you are going to learn many new things over the years. And, in turn, some day you will have the responsibility to teach others what you have learned."

"I have in my pocket," the father continues, "a card with four simple lines that, if you model your life after them, your mother and I will be very proud of you because you will grow to be the kind of person we want you to be." The father handed the young boy the card. But when he looked at it, the boy said, "Daddy, I can't read."

"That's right son, you can't read, and that's one of the reasons you're going to school. That's one of the first lessons you have learned. So today," the father said, "and today only, I'll read these four lines to you." They go as follows:

> There is a destiny that makes us brothers.
> None goes his way alone.
> All that we sent into the lives of others,
> Comes back into our own.

In those lines is a simple, yet powerful message for all of us. We must challenge ourselves to aspire to a higher destiny. To inspire others to dream big dreams, and to reach out to one another--to every segment of our society--to bring a greater sense of purpose to our lives. I am proud that the National Wildlife Federation has accompanied you on this challenging road, and I pledge our continued dedication.

I salute you and I thank you.

General Session XI: October 2, 1985, 8:15 a.m.

John F. Disinger, President 1985-1986, North American Association for Environmental Education; Professor, School of Natural Resources, The Ohio State University.

President's Commentary: Sustainable Development of the Association

Upon assuming the presidency of a professional association, the installee is tempted, and may feel obligated, to identify that current instant in time as the most critical of junctures for both the profession and the association. Issues demanding immediate attention, with concomitant though perhaps unvoiced implications of need for speedy resolution, are generally framed as questions: Where is the profession going? Where is the association going? Are they going in the same direction? Can, and/or should, they survive, either together or independently? If so, is it best for both that they survive together, or can one exist without the other? Is the survival and/or advancement of either inextricably intertwined with the similar condition of the other? Does it really matter?

It is a pleasure to report that the organizational health and prospects for survival of the North American Association for Environmental Education have never been better. NAEE has a history of successful conferences; another one has just been completed, not necessarily better than its predecessors but clearly maintaining the high standards we have come to expect. In terms of prospects, we may reasonably expect similar, or better, in 1986 under the conference chairmanship of Jerry Berberet.

NAEE has traditionally had strong leadership, most recently evidenced by the performance of our president, Arthur Sacks, continuously demonstrated by the consistently exemplary track record of our headquarters office directed by Executive Vice President Joan Heidelberg, unremittingly furnished by the dynamic balances of interests, productivity, and restraint exercised by a world-class Board of Directors, each member of which maintains firm commitments to the profession and the Association while simultaneously and zealously working purposefully to advance both within the frameworks of the particular subsets which they represent.

Perhaps NAEE's most meaningful contribution to the profession of environmental education is its balance, tenuous at times, among the interests, objectives, and especially operating styles of its three sections--Elementary and Secondary Education, Environmental Studies, and Non-formal. If NAEE has learned anything over the years--and it has--it is that the audiences, practitioners, and modi operandi of the several aspects of environmental education are in fact different, each thriving under non-identical institutional arrangements. But NAEE has also learned that the ultimate goals of each are remarkably similar, as evidenced by mutual subscription to the Association's mission statement, printed on page iii. This is a necessary condition for the survival of an Association,and profession, such as this. Nonetheless, our differences continue to provide sufficient challenge to keep us all attentive to our tasks.

As an organization, NAEE is demonstrably viable; it has survived, and can and will continue to do so. But to contribute in a more meaningful way to the ambitious goals of the profession, as NAEE has defined them in its mission statement, the association needs to do much more than it currently does. This implies a need for growth, not for its own sake but as a necessary condition for the improvement of the Association's effectiveness in the development of the profession. This requires, in a practical sense, a significant increase in services, most particularly in member services; though it has become increasingly less true during the past few years, the perception projects that the Association _is_ the Annual Conference, and vice versa. Altering this perception in part by clearly increasing member services, is a primary task for the upcoming year, and quite probably for the foreseeable future.

A number of significant events have taken place at this 1985 Conference. In addition to an impressive array of program elements dealing with varying topics and involving multiple styles and formats, including outstanding general sessions, contributed sessions, workshops, exhibits, films, resource material, and computer software, a variety of cooperative ventures has been in evidence. Two organizations of which NAEE is an affiliate, the Alliance for Environmental Education and the International Society for Environmental Education, have made major programmatic contributions; these should, I believe, be interpreted primarily as services to the profession and concurrently as good-faith representations of intent to work in concert with our Association for the advancement of common interests. Perhaps they indicate desire to work with fellow professionals to further the profession, regardless of organizational trappings. The Canadian Man and Biosphere Network (MAB/NET) again met with us. The American Nature Study Society chose to honor our conference by conducting its installation ceremony and holding its Board of Directors meeting here. The Conservation Education Association has made strong overtures to NAEE to work toward the development and implementation of cooperative efforts. NAEE, and other organizations, have been admonished by Paul Brandwein, Jay Hair, and others, to eschew differences, real and/or imagined, and get on with the business of environmental education--the profession--with a unified voice and effort. That is clearly the goal which all of us, within or in spite of organizational structures, must pursue.

For more than two years, NAEE has been involved in a study of its support system. More clearly stated, NAEE is concerned about what its headquarters does, how it does it, what should be expected of it, and what it should expect of us. NAEE has progress beyond the "kitchen-table" level of headquarters viability, though this is not readily apparent from an analysis of the annual budgets, including the proposed 1986 budget. NAEE officers and Boards of Directors have indicated their continuing desire to set policy and express willingness to entrust implementation to staff; unfortunately, the staff to accomplish all that is desired does not exist, for the very simple reason that provisions have not been made for it. A complicating factor is that elected leadership does not always reach consensus as to what directions the Association should take, With a net result of mixed policy guidance and, on not infrequent occasion, guidance vacuums. This may be an inevitable result of NAEE's three-section structure; if such be the case, what might be done to mitigate the inevitability?

NAEE may be seen as in position, right now, to re-inforce its efforts toward the achievement of its mission, which is the advancement of the profession. We can do this by maintaining and improving those valuable services already provided, increasing the quantity and quality of our services to both the profession and to our membership, finding ways to enhance the quantity and quality of cooperative activities with individuals and organizations espousing similar goals and objectives, and enhancing organizational structures for achieving these ends. My personal goal as president for 1985-86 is to work within the Association, and outside of it, to provide both leadership and "facilitator-ship" for the advancement of both the Association and the profession, consonant with this framework.

II. Symposia and Panels

II. A. Learning About Soils--The SCS/District Network

Malcolm Crooks, National Association of Conservation Districts (moderator); Tom Levermann, USDA Soil Conservation Service--Why Study Soils? What Are the Issues?; Duane A. Bosworth, National Association of Conservation Districts--How to Use the District/SCS Network in Your Program; Marlena Campbell, Ocean County Soil Conservation District, Toms River, New Jersey--The Ocean County District Education Program.

Why study soils? What are the national issues about soil degradation? And how can you use the existing network of soil conservationists across the country in your program? Specific conservation education programs undertaken by this network were used as examples. Emphasis was placed on helpful information for educators at any level. (Presented in cooperation with the National Association of Conservation Districts and the American Society for Environmental History)

II. B. The Meaning of Scholarship in Environmental Studies.

David L. Hanselman, SUNY College of Environmental Science and Forestry (moderator); Richard L. Perrine, University of California-Los Angeles; Arthur B. Sacks, University of Wisconsin-Madison; Ross S. Whaley, SUNY College of Environmental Science and Forestry.

The meaning of scholarship is well established in the traditional disciplines. But what constitutes "scholarship" for interdisciplinary faculty in environmental studies or science? Must they turn to disciplinary research and writing for recognition as scholars? What is the worth of applied research or creative achievement that is not entrenched in an already established field? This panel brought together three scholars from different backgrounds to discuss these and similar questions which haunt academicians in environmental studies programs.

II. B-1. Dr. Whaley's Paper was presented in General Session III (pg 21).

II. B-2. An Environmental Professional's Point of View, by Richard L. Perrine

A number of valuable ideas addressing the question of "The Meaning of Scholarship in Environmental Studies" have been expressed as part of this panel discussion and at this Conference. The particular focus presented here stresses an environmental professional's point of view.

Environmental Studies by their nature tend toward integration and disciplinary breadth as contrasted with narrow focus and depth. The basic question of what constitutes "scholarship" in this circumstance itself raises several important questions.

First: do studies which successfully integrate the original research and thinking provided by others, each in his or her own discipline, require truly creative thinking, and so constitute "scholarship?" Are there examples of work by environmental studies faculty which can demonstrate such creativity? Are there somewhat parallel situations elsewhere in the Arts and Sciences in which comparable creativity may be properly recognized?

Second: faculty whose teaching is in environmental studies or in comparably broad environmental science and technology often design and carry out a limited share of disciplinary work. In this, they build on their own disciplinary origins. To be accorded respect as "scholars," is it necessary for those in environmental studies not only to do some such credit-worthy research, but to complete a body of work--that is, quantity--nearly comparable to that of dedicated disciplinarians?

Third: the application of science is routinely counted as "scholarship" when it is performed in a professional school, such as engineering, provided it stresses science--"Engineering Science" is an example. Is the creativity of such work superior, or equivalent, to similarly oriented creative effort performed by more broadly based environmental studies faculty? If so, in what ways?

Fourth: research which builds bridges between and among environmental science, engineering, and public policy is essential to the resolution of our most vexing environmental problems. What are the characteristics of research within this broad area which properly define work as "scholarly?" Are these unique, or really much the same as for scholarship within recognized disciplines?

I would like to start by pointing to what I think is at least a partial answer to these questions. An effective way to do this is by looking to a relatively recent assessment of what is currently surely one of society's most feared consequences of some environmental mismanagement. Thus, I quote from an excellent article by Richard Doll and Richard Peto, in The Journal of the American Cancer Institute, entitled: "The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today" (Doll and Peto, 1981).

These authors note a concern for the views others may have about the scholarly quality of their work:

> If reports covering a wide field are ever to be written at all it is inevitable, since we are not immortal, that those who write them should spend less time on any one part than can be spent by someone who concentrates on a single subject. Some, whose scholarly austerity is unbending, will conclude that reports covering a wide field should not be written at all, or, if written, should consist of chapters by a multitude of authors. There is, however, something lost when many authors cooperate. If any balance is to be achieved between the findings in laboratory experiments and the distribution of disease that actually occurs in the population as a whole, and if the major and minor causes of death are to be seen in proper perspective, then the various aspects should be synthesized in a consistent way, which would have increased in difficulty exponentially with the number of authors.

While the human health problem represented by cancer is an integral part of environmental studies, it would not often be seen as a central theme. More commonly, we would look toward the web of human-environment interactions that need to be understood and addressed if sound public policy is to be devised. Thus we consider a similar problem in its general character, but one even more vast in its scope and complexity. The focus, as I see it, must be the interface between environmental science, its application, and policy. This includes environmental problem-solving. At its heart lies the ecosystem viewpoint stated broadly, not in the narrowest sense adopted by some research biologists. If we approach from a different starting point, such as engineering, we will come to the same viewpoint but perhaps use different terminology. This would be the system viewpoint, again seeking an optimal result, and not looking from a narrow, subdiscipline approach.

Is there room for scholarship in work developed this way? Certainly! Is there something different about it--unique--when compared with disciplinary work? Certainly!

A Rationale

Ecosystems, and real environmental problems to be addressed, do not conveniently divide into disciplines (Wohlman, 1977). We do not see a zoology problem, a botany problem, a civil engineering problem, or a resource economics problem. A more typical example might center on a mountain stream and fresh water ecology. By its nature the problem would include stream-side forest ecology. There would be equal concern for stream and forest utilization, both in the natural sense and for the benefit of humans. Impacts which could derive from improper utilization could extend from truly wild lands to urban populations. This represents a subject area immensely in need of scholarly study, and of communication of study results.

Universities, however, are organized around established disciplines, not ecosystems. They also are not organized around problems to be solved. Disciplines are an administrative convenience, and an often essential foundation for basic research. But to understand and grow intellectually into the larger viewpoint we need education which is transdisciplinary, which builds on, which transcends, and so is capable of integrating knowledge from individual disciplines (Perrine, 1982).

For at least the last century, science has been fissioning. What once was natural science first divided into physics, chemistry, mathematics and biology. Subsequent growth within biology, as one example, has been accompanied by division into botany, zoology, molecular biology and microbiology. And today when we look at microbiology, we see completely separate literature on microbiology of soils and of fresh water aquatic ecosystems. Returning to the example of a mountain stream and its closely linked surroundings, we see both of these different kinds of microbiology weave their way into the environmental problem, begging to be understood. Who is qualified to address this situation in a scholarly manner? The water resource development engineer?

It is clear that the reductionist approach characterized by most of our educational structure has its place. This approach is needed for good teaching and research at the forefront of individual disciplines. Unfortunately, it tends to carry with it other consequences. Tribadism--the locking in of accepted knowledge within a fenced-off pasture, the creation of a domain to be grazed by a select few--is too often overemphasized. It is a well-established fact that problem-oriented research cannot be carried out in splendid isolation. To provide an information base which will be effective requires scholarship which transcends reductionism; we must learn to view and understand complex systems as a whole. We must further attract students to learning, and to working in this pattern. We must expose them to the holistic view which is essential to the eventual solution of environmental problems, and to the provision for future generations of a sustainable environment.

University Structures

It has been noted by Lynton Caldwell in his article, "Environmental Studies: Discipline or Metadiscipline" (Caldwell, 1983), that all conceptual structures, including how knowledge is perceived and organized, are artifacts of the mind. There is a logic in this structure, but it is in no way a unique, deterministic result. If we had but started from a slightly different origin, or if we had but been buffeted by slightly different forces as our educational structure evolved, the result could well have been much different. Academic restructuring may be seen as the answer by some. But established arrangements in the academic world have tremendous inertia and persistence; some might call it "tenure." Inadequacies are tolerated or not recognized in preference to the uncertainty and disruption associated with change. Thus, recognition of what constitutes scholarship within environmental studies is likely to come through a continuing, lengthy struggle rather than some sharp, dramatic change.

Margaret R. Biswas and Asit K. Biswas, in their article entitled "Major Requirements for Environmental Education" (Biswas and Biswas, 1982), list major factors they see as essential to its success. These include: interdisciplinarity, interrelatedness, flexibility, non-dogmatism, problem anticipation, and emphasis on problem-solving. I accept all of these, though I prefer to combine the first two as transdisciplinarity.

There is a hierarchy of structures which relates the elements basic to the evolved systems of nature, and of man. But for the systems dealt with by environmental studies, no single part of any such hierarchy is intrinsically superior or inferior to any other. The relative status and relationships among fields of knowledge, given our present rudimentary understand, are matters yet to be discovered. There are progressive levels of complexity and integration which at any point may prove quite useful in providing us, in a creative way, with an image of our world and the problems within it we choose to address. The life sciences tend to differ from the physical sciences in a natural requirement that they be treated simple, despite a greater level of complexity. To bring in man, and the social and behavioral sciences, carries this thinking one giant step further. As has been noted by Caldwell in the source cited earlier (Caldwell, 1983), Environmental Studies appears, along with the sciences of intelligent human behavior, near the top of what may be termed the "informational food chain."

A Conclusion

Can we now conclude what meaning should be attached to "Scholarship in Environmental Studies?" I believe that we can. To be scholarship, there must be creativity involved, the author must provide new knowledge which helps us see in a more perfect way the nature of an environment, its interactions, or an environmental problem and its solution. Further, the viewpoint must be that of the transdisciplinarian, it must do more than state new factual knowledge about elements of the environmental system. It must integrate these bits and pieces into a superior picture of how the system functions as a whole. To do this is difficult, but not impossible. And to do this is essential if we, as environmental educators, are to be successful in our basic mission.

REFERENCES

Biswas, Margaret R. and Asit K. Biswas. 1982. "Major Requirements for Environmental Education." Environmental Conservation 9(2): 125-130.

Caldwell, Lynton K. 1983. "Environmental Studies: Discipline or Metadiscipline." The Environ. Professional 5(3/4): 247-259.

Doll, Richard and Richard Peto, 1981. "The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today." J. National Cancer Inst. 66(6): 1192-1260.

Perrine, Richard L. 1982. "TSCA and the Universities: Educating the Environmental Chemical Professional." The Environ. Professional 4(2): 187-199.

Wohlman, M. Gordon. 1977. "Interdisciplinary Education: A Continuing Experiment." Science 198: 800-804 (25 November).

II. B-3. Scholarship in Environmental Studies, by Arthur B. Sacks

As an epigraph to his article, "Is There a Conflict Between Teaching and Research?" Cairns (1978) cites the following quotation from R. Q. Marston (1977) which I offer here as a proper introduction to the subject of the meaning of scholarship in environmental studies:

> The knowledge a faculty member obtained in graduate school is like the principal in a bank account. If one draws on the principal and has no source of income, the principal

> is soon gone and bankruptcy follows. Research prevents intellectual bankruptcy. Basic research, then, makes possible competent teaching.

The point here is clear, and no one at a major research university in this country or any other around the globe would take issue with it. At any such institution, research is recognized as an essential component of good teaching. Without it, as Cairns has summarized, one cannot remain current on developments within a field, disciplinary, multidisciplinary or interdisciplinary; one cannot adequately direct the investigations of ideas or problems by students, particulary at the graduate level; one cannot fulfill the dual obligations of transferring the best information to students and generating new knowledge; and, one loses the ability to develop approaches to problem-solving--an ability which an educator is obliged to foster in his or her students. In these failures come a larger societal failure: a teacher's own mental stagnation leads to lifelessness in the classroom and the inadequate development and preparation of the minds of future citizen-leaders. To quote Cairns (1978), "Cultural and scientific (and therefore human) progress will depend primarily on this group and it is not possible to educate them properly without directly associating them with the present generation of creative scholars and scientists. Not only will they otherwise not learn how to conduct original research, but they won't know what the major problems are."

Although I would maintain that any educator in higher education--whether in a major research university, a four-year college, or in a community college setting--should engage in some kind research, I am aware of the limitations on faculty time at four-year and community colleges and the arguments that teaching, not research, is their primary mission. If an interesting issue in its own right, I will not attempt to address this issue further here. Rather, I wish to turn to the nature and meaning of scholarship in environmental studies, and the inherent difficulties, both intellectual and institutional, associated with such activity.

I would like first to indicate that for purposes of this discussion, I do not distinguish between research and scholarship, though, appropriately, some might. To some, research connotes designed investigation, the discovery of new knowledge. Scholarship, on the other hand, is often applied either to more abstract research--the pursuit of ideas that does not necessarily require application of the scientific method--or to a process of critical analysis and evaluation which focuses less on the discovery of new knowledge and more on the interpretation of existing knowledge. I will not indulge in the niceties of such distinctions, however, and I use the terms Synonymously.

There is need, nevertheless, to differentiate between the terms "basic research" (or scholarship) and "applied research" (or scholarship), as such a distinction speaks directly to the nature of investigations in environmental studies, and the difficulties associated with these investigations. To do this we need first to talk about the nature of environmental studies as an interdisciplinary, problem-focused field, as opposed to a traditional disciplinary field.

As I have indicated elsewhere (Sacks, 1985), though environmental studies has had antecedents in the disciplines, the field emerged rapidly during the 1960s and 70s as a result of what Caldwell (1984) refers to as "an ad hoc response to the sudden emergence of public concern." Such concern was perhaps first articulated as the perception of pollution as a direct threat to human health and welfare. In any case, two points are especially worthy of note: (1) that this academic field was spurred by public concern; and (2) that this concern related to problems of a "real-world" nature that demanded action by public and private sector decisionmakers. Further, as a field generated by problems emanating from the interactions of people and biogeochemical reality, it is inherently interdisciplinary in nature.

Though the field has expanded and matured considerably over the past decade and a half, now more often examining broad issues on a global and biospheric scale, its essential problem-oriented focus has continued to be the driving force of the field, and continues to give shape to the research conducted within it. Such research is characterized by its interdisciplinarity, requiring the integration of the broad fields of knowledge: the biological and physical sciences, the humanities, and the social sciences, and by its applied nature, focusing on the demands and peculiarities of problems that are "out there," which, because of their urgency, society as a whole and we as individuals must treat on an immediate basis, or which because of their scope and magnitude we must explore long-term.

Such research is distinguishable from basic research, which is the purview of the disciplinarian. As Hare (1970) and others (e.g., Steinhart and Cherniak, 1969) contend, the disciplinarian makes a choice to explore a problem that is compatible with his or her own competencies and interests, selecting issues and questions that lie within the general framework of a discipline, rejecting those that lie outside. Basic research rests on a grounding of well-recognized if debatable tenets or paradigms of disciplines. The interdisciplinary environmental studies investigator, on the other hand, more often responds to a set of actual conditions that present themselves. Such conditions frequently require a rapid public policy response--decisions to act one way or another, or not to act at all.

The environmental studies researcher, then, works in the realm of complex problems faced by society, problems that require the expertise, knowledge, and information of a multitude of disciplinary perspectives integrated to yield a picture of the problem in its totality, and producing the groundwork upon which policy recommendations may be framed or offering such recommendations directly as part of the research. Research of this nature necessarily demands both a team of experts representing the key disciplinary perspectives that must be present to draw such a picture, and a methodology for integration. At the outset of such investigations, it is essential to delineate the full scope of the problem so that the proper team can be built.

There are many problems inherent in interdisciplinary team-building which affect the quality of the research conducted. Not the least of these is the fact that any given issue under investigation may require expertise that is not readily available at a single institution. Universities are not known for their flexibility or their ability to respond rapidly to such situations. The mechanisms to locate and hire personnel quickly in order to seize such opportunities characteristically are not in place in universities, even when there are ready funds. As a result, research opportunities are increasingly fielded by the private sector through consulting firms or other research entities with large stables of available personnel, personnel often drawn from the university community on short-term consulting contracts. In an effort to respond to this institutional limitation, and fueled by a federal administrations whose philosophy is oriented to the private sector, in recent years universities have attempted to be more creative, utilizing university research consortia as well as cooperative agreements with the private sector or with government.

If the proper research team can be constructed within the time constraints of funding agencies and can be responsive to the immediacy of the issue to be investigated, yet another inherent difficulty comes into play. Most of those engaged in interdisciplinary research have themselves been trained in the disciplines. As a result, it often takes a significant amount of time for a group of disciplinary-trained faculty to gel as an interdisciplinary team, especially if they are put together on an ad-hoc basis to respond to an opportunity. The need to become conversant in the assumptions, the jargon, and the perspectives of other disciplines and what they can lend to an interdisciplinary research project argue for a stable structure within universities to permit on-going interactions across disciplines. Such a structure allows an interdisciplinary faculty group to "hit the ground running" when an opportunity arises, and builds in fluency in working with individuals across disciplinary lines.

Still another institutional problem concerning team research involves the reward for such effort. Often, only major research universities find that the benefits of such team research sufficient enough to reward those engaged in it, and at times even these institutions have difficulty providing adequate recognition. When salary and promotional decisions are made by disciplinary-based executive committees, interdisciplinary activity, especially team activity, frequently is perceived with a jaundiced eye. Without adequate rewards and with built-in disincentives, researchers are often discouraged from straying far from a disciplinary home base.

In addition to issues involving the logistics of team building, there is also the substantive intellectual question concerning the methodology of integrating disciplines in the required manner. Often, research conducted in an interdisciplinary mode produces only a multidisciplinary snapshot of a problem rather than true integration. Environmental systems analysis techniques, which are indebted to fields as divergent as ecology and industrial engineering and computer science, have in large measure helped researchers overcome such difficulties. Such techniques, however, are hardly foolproof, and they work best with physical and biological phenomena as well as certain societal features. Treating attitudes, values, beliefs, and psychological states of mind--which may be as important or even more so than any of these other phenomena in "real world" problem settings--are more difficult to map and include. Further work in this area is needed.

The problems associated with conducting environmental studies research are made even more complicated by the academic and institutional hurdles that university researchers must leap if they hope to be successful within the university itself. One of the primary hurdles is conquering the prejudice toward interdisciplinary studies held by the disciplinary scientific community. As Caldwell (1983) has argued, the more "fully developed and reliable" basic sciences have advanced through an ever more progressive degree of reductionism--the analytical approach of the disciplines that separates a complex phenomenon into its most rudimentary parts. Though science has made major and rapid advances utilizing this approach, as Caldwell goes on to say, ". . . the necessity and practical successes of reductionist science have caused some persons to equate reductionist methods with science per se."

The result of this confusion has led disciplinarians to regard reductionist science as the only science worth a scientist's creative energy and effort and to regard fields which rely upon methods of synthesis as suspect, if not inferior. University researchers--especially pre-tenured junior members of the faculty--risk receiving professional condescension and disdain which takes its most drastic forms in tenure denials and unduly harsh decisions at salary time. Indeed, faculty based within disciplinary departments but who are oriented intellectually toward interdisciplinary research are often forced to choose between publishing in disciplinary journals and reaping the visible rewards of academic success in a major research institution--tenure, stature, and salary--and interdisciplinary research published in interdisciplinary journals or published as final project reports for governmental agencies. The latter may be unsuitable for traditional peer-reviewed journals, but nevertheless represent sound scholarship. Only the most brilliant and politically astute junior faculty are able to emerge unscathed in this process. As a result, environmental studies typically tends to attract only the most established and senior faculty, those who have already made their reputations and are less subject to the criticism that they lack rigor.

Notwithstanding all of the deterrents to faculty participation in such research, a solid body of environmental scholarship has developed over the past fifteen years. And with such scholarship have come sound, well-respected interdisciplinary journals for publishing research findings, and professional societies organized to help promote it. That such work continues in the face of considerable odds suggests the degree of commitment to the mode of inquiry called environmental studies, and faculty dedication to environmental problem resolution. Over time, the real scholarly contributions that have been made by those in environmental studies have come to be recognized. The problems that have been faced by 20th century society have demanded a new approach that has proven vital, if at times uneven in quality. At the edge of the 21st century, when the calculus of exponential population growth promises to bring even more drastic stress to our biosphere and to social organization, the demands for individuals capable of conducting such study will surely rise. As environmental educators, we must strive to further our efforts in preparing such individuals, even if countervailing institutional and collegial pressures persist. Not to do so would be to neglect our role as educator-scholars and as citizens aware of our collective future.

REFERENCES

Cairns, John Jr. 1978. "Is There a Conflict Between Teaching and Research?" The Biologist, 60(4): 123-130.

Caldwell, L.K. 1983. "Environmental Studies: Discipline or Metadiscipline?" The Environmental Professional, 5(3): 249-259. Special Environmental Education Issue, edited by Arthur B. Sacks and Craig B. Davis.

Hare, F. Kenneth 1970. "How Should We Treat Environment?" Science 167: 352-355.

Marston, R.Q. 1977. "The Case for Basic Research", Florida State University Bulletin, 2(3):1.

Sacks, Arthur B. 1985. "The Organization of Environmental Studies in the University - A North American Perspective", unpublished. Presented at 3rd International Conference on Environmental Studies, Sunderland Polytechnique, Sunderland, U.K., 11 September 1985.

Steinhart, J.S. and Cherniak, S. 1969. The University and Environmental Quality--Commitment to Problem Focused Education: A Report to the President's Environmental Quality Council. Executive Office of The President, Office of Science and Technology, Washington, D.C.

II. C. How Can Teacher Education Be Emphasized to a Greater Degree in NAEE?

E. Paul Hart, University of Regina, Saskatchewan (moderator); Lillabelle Holt, The Ohio State University, Newark; Louis A. Iozzi, Rutgers University, New Brunswick, New Jersey; Bob Jickling, Simon Fraser University, Burnaby, British Columbia.

Environmental education is an essential component of teacher education programs. The statement is debatable, unfortunately, and environmental education requires justification within teacher education. Directed discussion on development and implementation of environmental education programs in faculties of education is also required. This session provided a forum for discussion about how NAEE can best provide leadership and coordination of environmental education efforts in teacher education.

II. D. A Call for Constructive Dialogue Between UNEP and Environmental Educators

Richard A. Hellman, Washington Representative, Friends of UNEP; Joan M. Brown, Washington Representative, United Nations Environment Program; Peter Thacher, World Resources Institute, Washington, D.C.

A principal continuing goal of the United Nations Environment Programme (UNEP), as reflected in repeated resolutions of its governing council over the years as well as in policy statements by its Director, Mostafa Tolba, has been close cooperation with non-governmental organizations, national and international, and particularly those with an educational or informational thrust. As a key component of its outreach to the non-governmental community, UNEP this year has invested seed money in the newly-founded North American Friends of UNEP.

II. E. Federal Perspectives on Help for Schools and on Programs for Environmental Education

Earl E. Huyck, sociologist, National Institute of Child Health and Development, retired (moderator); Winston A. Wilkinson, U.S. Department of Education--Partnership in Education Program (Adopt-a-School Program); John R. Paulk, Tennessee Valley Authority--Federal Interagency Committee on Education/Subcommittee on Environmental Education; Edward J. McCrea, USDA Fish and Wildlife Service--Federal Programs for International Environmental Protection and Education; Allan T. Smith, USDA Extension Service--Federal Programs for National Environmental Protection and Education.

The objectives of this panel were to provide an informational overview of the broad range of programs and activities through which agencies and departments of the Federal government assist schools. Emphasis was given to programs that: (1) bring together business and private sector leaders in order to build better support and technological and business skill development and (2) promote resource conservation, protection, and wise use at the local, national, and global activity levels.

II. F. Research in Environmental Education 1971-1982: A Summary, including Needs and Recommendations for Future Research

Louis A. Iozzi, Chairman, National Commission for Environmental Education Research (NCEER); Rutgers University, New Brunswick, New Jersey (moderator); Peter J. Bastardo, New Jersey Department of Education, East Brunswick; Arthur W. Edwards, Rutgers University, New Brunswick; Jody M. Hines, University of Northern Iowa, Cedar Falls; Harold R. Hungerford, Southern Illinois University, Carbondale; Thomas J. Marcinkowski, Southern Illinois University, Carbondale; R. Ben Peyton, Michigan State University, East Lansing; Lisa Yount Specca, Rutgers University, New Brunswick; Audrey N. Tomera, Southern Illinois University, Carbondale.

Over the past four years, the NAEE's National Commission on Environmental Education Research (NCEER) has compiled and published a volume of abstracts of EE research completed over a 12-year period. More recently, the NCEER published a companion volume which includes a concise summary of that body of research, identifies research needs, and makes recommendations for future research to help fill the gaps in the existing body of research literature. Members of the NCEER presented a summary of their work, including recommendations for future environmental education research.

II. G. Environmental Education--Yesterday, Today, and Tomorrow

John J. Kirk, New Jersey School of Conservation, Branchville (moderator); Charles Hopkins, Area East School Board, Toronto, Ontario; Rudolph J. H. Schafer, California Department of Education, Sacramento; A. Clay Schoenfeld, University of Wisconsin-Madison; Betty van der Smissen, Bowling Green State University, Ohio.

The historical roots of the environmental education movement were reviewed, tracing their evolution to the present time and projecting future developments. Areas addressed included resident programs, urban centers, the school curriculum area, environmental communication, and global dimensions.

II. G-1. Environmental Communication As Education, by A. Clay Schoenfeld.

The text of my presentation is this: in our kind of country, enlightened environmental husbandry depends, if not on total public support, at least on general public sufferance. Environmental communication media and modes are the phloem--the conduits--through which flows the environmental information basic to the cultivation of a xylem--a fiber--of public opinion favorable to environmental sanity.

Now let us at the outset define our terms a little more precisely. What exactly is environmental communication; in contradistinction, particularly, to environmental education?

With respect to the root terms, Webster is by no means clear, nor need he be. Communication is said to be the "interchange of thoughts and opinions," while education is said to be the "act or process of developing mentally and morally." But certainly communication can lead to education, and education can involve communication.

For the practical purposes of our discussion here, let us define communication as the interchange of both cognitive facts and affective opinions through other than formal means of education; meanwhile recognizing that such interchange can in fact effect education, and that formal means of education must in fact involve communication. Environmental communication then becomes the sum of those portions of the total information flow in the social system that have a common environmental content.

Conservation-Communication Symbiosis

Although we are sometimes inclined to think so, environmental communication did not spring to full flower overnight on Earth-Day, 22 April 1970. Communication had been the handmaiden of the antecedent conservation movement. For striking examples of the role of communication in conservation, look at the careers of every one of the leaders recorded in Professor Douglas Strong's book, The Conservationists:

Henry Thoreau was a sometime pencil-maker and quasi-hermit who found his calling as a great writer. Frederick Law Olmstead, pioneer landscape architect, early turned to writing to promote his city planning concepts. George Perkins Marsh, the epitome of the Renaissance man--lawyer, farmer, manufacturer, congressman, diplomat--is best known today as a landmark author. John Wesley Powell personally publicized his classic explorations in newspaper articles and books. John Muir might have whittled away his days as the "tramp" he said he was if he had not entered into a remarkable alliance with a leading magazine editor of the day. Stephen Mather came to his National Park Service from a background as newspaper reporter and soap salesman. Aldo Leopold was early on the Secretary of the Albuquerque (N.M.) Chamber of Commerce and the writer of innumerable pamphlets. FDR turned to novel radio chats to sell his CCC, SCS, and TVA. Stewart Udall's pen helped his fellow Americans discover the "quiet crisis."

Gifford Pinchot may have been the premier communicator of them all. Author Strong calls him "a shrewd manipulator of public opinion...Through a stream of press releases and speeches, and by active lobbying in Congress, he carried his crusade for 'practical forestry' before the American people." Felice Goodman Levin, a particular student of Pinchot as a PR man, says the devices his team used were "as sophisticated as any could have been without the availability of broadcast media": publications, newspaper publicity, periodicals, teacher education, field manuals, correspondence, organizing of outside groups, and, of course, the staging of such events as the celebrated 1908 White House Conference on Conservation.

But Dr. Strong, in his assessment of leading conservationists, may have been swayed by the captivating personalities he was portraying. What of historians and social commentators viewing more dispassionately the "development of environmental concern," which is the sub-title of a recent collection of seminal essays assembled by Carroll Pursell? How do those observers view the role of communication _vis-a vis_ what today is environmental education?

Roderick Nash credits Robert Underwood Johnson, associate editor of _Century_, with conceiving and managing the campaign to create Yosemite National Park in 1890. James Leonard Bates credits a "remarkable and versatile" author, W J McGee, with scripting the White House Conference on Conservation in 1908. Donald C. Swain credits Herbert Hoover in the 1920s as he "crusaded from his cabinet office in Washington for conservation causes." Leo Marx credits "the mass media" with beginning "to spread the alarm toward the end of the 1960's," although he points out that America's traditional pastoral literature had previously represented "a serious criticism, explicit or implied, of the established social order" and its environmental degradation. Norman J. Faramelli agrees that "during 1970 the ecological crisis was brought before the American public via television, magazines, newspapers, and other media." Editor Pursell points out that in that year three national magazines of varied persuasions devoted special issues to the problem, each of which was turned into a book--the magazines _Ramparts_, _The Progressive_, and _Fortune_.

Roots of Environmental Communication

Now let us look a little more systematically at the antecedents of today's environmental communication, for if we are really to understand the genre, we must appreciate its genealogy.

Nature Writing

While nature writing can be traced back at least to the Psalms, in its modern form American nature writing has taken its inspiration from the Lake Poets of England in the 17 and 18 hundreds, and especially from William Wordsworth. Perhaps in his "Lines Composed Above Tintern Abbey" he captured most succinctly the characteristics of nature writing: fascination with nature's vast, pulsing harmony, in and of itself and as a charmed, magic casement opening on universal truth as revealed through nature.

Few products of high school literature courses are unfamiliar with at least some works of distinguished early American nature writers, 1830-1920: for example, William Cullen Bryant, Thornton W. Burgess, John Burroughs, Ralph Waldo Emerson, David Grayson, John Muir, Henry David Thoreau, Walt Whitman. Their more modern counterparts, while retaining a sense of awe, have informed their writings with a more sophisticated ecological understanding: Ansel Adams, Hal Borland, Rachel Carson, August Derleth, Loren Eiseley, Joseph Wood Krutch, Aldo Leopold, Sigurd Olson, Donald Culrose Peatty, Edwin Way Teale, and many others. For readers, if not for writers themselves, nature writing has also represented an escape from urban degradation, a nostalgia for the seemingly simple bucolic joys of a pre-industrial age. The presence of nature writing--and nature photography--continues measurable today. The magazines National Wildlife and Audubon, for example, are devoted pretty exclusively to the genre.

Outdoor Recreation and Travel Writing

While closely related to nature writing, outdoor recreation and travel writing have distinctive lineage and characteristics.

Writing under the pen-name Fran Forester, William Henry Herbert brought outdoor writing to America in the late 1830s. Appealing to devotees of hunting and fishing, he outlined the basics of sporting etiquette and lamented the commercial destruction of wildlife and habitat. With the appearance of national periodicals like American Sportsman (1861), Forest and Steam (1873), and American Angler (1881), such outdoor writers as George Bird Grinnell and Emerson Hough not only delineated the good life of the "sportsman" but played an active role in early movements to conserve wildlife, forests, and parks. Today the genre is represented by the outdoor writer on the sports pages of practically every daily newspaper and by the "big three" outdoor magazines, Field and Stream, Sports Afield, and Outdoor Life. Other writers and other publications specialize in other forms of outdoor recreation, from golf to backpacking.

It was travel writers who lured our ancestors to America. Beginning at least with Michael Guillaume St. Jean de Crevecoeur in 1782, educated visitors from Europe sent back ecstatic essays about the New World. In the 1830s, as large numbers of Americans themselves began to explore their own country either for recreation or for homesteading, travel writing flourished. Typically one part nature writing, one part tour guide, and one part hard sell, travel writing was the plow that broke the plains, projected us to the Pacific, and laid the groundwork for early conservation successes; for example, the dispatches of a young Army lieutenant that finally lent credibility to stories about the wonders of Yellowstone. Today, of course, travel writing continues to be big business, and in the case of National Geographic, at least, it frequently has an ecological caste.

Science Writing

Ben Franklin may well have been the first American science writer. His story of his "Electric Kite" was duly recorded in his Pennsylvania Gazette in 1752. Scientific American first appeared in 1845, Science Magazine in 1883, the American Chemical Society News Service in 1919. In 1921 David Dietz became a newspaper science writer for Scripps Howard, Watson Davis' column, "What's New in Science" previewed in the Washington Herald, and Science Service sent out its first news syndicate weekly release. In 1923 Alva Johnson won a Pulitzer Prize for reporting the final acceptance of Darwin's theory of evolution by the science community. The 1887 creating of agricultural experiment stations at landgrant universities had stimulated the development of "technology transfer" specialists in agriculture via multiplying farm journals, and the emergence of medicine as a science rather than a barber-pole art produced a whole range of health writers. By 1934 the National Association of Science Writers had "officialized" the genre. In 1945 William L. Laurence won a Pulitzer Prize for his sensitive reporting of the first atomic blast. Scientists particularly concerned about nuclear proliferation organized a Scientists' Institute for Public Information in the late 1940s. In 1958 the SIPI fostered a Committee for Environmental Information, which now has its own journal, Environment. Environmental engineers communicate through Environmental Science and Technology. Some science writers today have become environmental or energy specialists.

Public Affairs Reporting

Public affairs reporting, of course, is as old as journalism, but at the turn of this century in America it took on striking proportions. Print technology and urbanization combined to produce the first truly national newspapers and magazines with massive circulations, and their growing freedom from political patronage opened their columns to a cadre of scintillating investigative reporters, whom Teddy Roosevelt in a moment of pique labeled "the muckrakers". Ida Tarbell on Standard Oil, Upton Sinclair on the meat packing "jungle," Lincoln Steffens on "the shame of the cities"--these and many others brought great visibility to brass-knuckles journalism and environmental issues. Robert Underwood Johnson of Century magazine particularly lent muckraking a classic environmental flavor with his stories and editorials exposing the rape of forest and parklands. From that day to this, solid public affairs reporting has accompanied if not inspired every conservation crusade, from the long fight over the Tennessee Valley's Muscle Shoals to today's debates over a national energy policy.

Persuasion

Persuasion, too, has a long history in America, dating at least from Thomas Paine's times that tried men's souls. But again it was at the turn of the century that persuasion and conservation made history in the person of Gifford Pinchot, as we have seen. A more modern counterpart has been David Brower, who in 1954 put together a remarkable consortium of conservation groups whose collective voice actually caused Congress to halt a Colorado dam that would have inundated Dinosaur National Monument. Brower's use of economic statistics quite as much as aesthetic sentiments set the tone for much of the rhetoric of the environmental decade beginning 10 years later. For environmental persuaders of varied stripes, James Grunig has recently put together a fairly exhaustive "review of research on environmental public relations."

Environmental Communications Emergence

When did nature writing, outdoor writing, science writing, public affairs reporting, and persuasion merge into environmental communication?

Each root produced a flower stalk in the 1960s. Wallace Stegner's 1960 "The Wilderness Idea," a lyrical essay on America's last strands of naturalness and solitude, was one of many nature writings that helped generate support for the passage of the Wilderness Act in 1964. While Aldo Leopold's Sand County Almanac had appeared originally in 1949, it was not until a 1966 paperback edition received wide circulation that his "noble elegy for the American earth and a plea for a new land ethic" vaulted classic outdoor writing into the ken of millions. In 1962 another rather small paperback hit the bookstands of America with the impact of a blockbuster, authored by a former U.S. Fish and Wildlife Service editor-biologist. Quietly and calmly this premier example of science writing questioned the massive use of chemical pesticides. Rachel Carson's Silent Spring "probably did more to alert the American people to the critical needs of their environment and their own health than any form of journalism before or since." The Rienows' Moment in the Sun in 1967 represented the searchlight of a team of public affairs reporters turned on the intrinsic beauty and the creeping degradation of the organism called America. Stewart Udall's The Quiet Crisis in 1963 was in the great tradition of the American politician turned persuader for "an ever-widening concept and higher ideal of conservation". The 1969 National Environmental Policy Act, requiring environmental impact assessments on all major federally funded projects, created a new "hook" on which to hang environmental reporting, and vastly increased the quantity and quality of newspaper coverage of the environmental beat. The year 1969 also saw the emergence of a dozen specialized publications as custom carriers of environmental communications. At latest count, there are now 93.

Irrespective of their roots, are there any common denominators among the various forms of environmental communication? Yes. All are focused on a comprehensive rather than a compartmentalized approach to the people-resources-technology system. A basic theme in environmental communication hence is interdependence--that everything is connected to everything else. This is "the principal intuition of the 20th century". The practical problem faced by all environmental communicators, of course, is how to recognize and describe sound, fair trade-offs among energy, economy, and environment.

I am often asked, "What was the single most effective environmental education device or message of the past period?"

Rachel Carson's Silent Spring in 1962 is often described as the firebell in the night that first alerted America to environmental hazards. It did that, but it was essentially a single-issue approach. Lynton Caldwell's "Environment: A New Focus for Public Policy," in Public Administration Review in 1963, was a landmark paper, but it reached only a scholarly audience. So did the "Future Environments of North America" symposium in 1965. A unique joint House-Senate colloquium on "A National Policy for the Environment" in 1968 prodded Congress but received minimum press coverage. Big coverage of the Santa Barbara oil spill in 1969 some sociologists have said triggered massive environmental concern, and other sociologists attribute the rise of a public environmental awareness to Earth Day and its associated mass media splash.

But I would have to say that, in my opinion, the single most effective environmental education message of the century was totally inadvertent--the 1969 view from the moon of a fragile, finite spaceship earth, fulfilling the description of Adlai Stevenson a decade before, that here we are, partners on a very small planet, with nothing between us and infinity but what we have and make of it. It was a powerful visual message, indeed, and Walter Cronkite and the 5:30 CBS News riveted it in our minds. By conquering the frontier of outer space we had discovered another frontier--the search for a state of harmony between humankind and the only earth we have.

Regardless of which of these devices or messages you consider the more compelling, you will notice they are all examples, not of environmental education in any formal sense, but of environmental communication as education.

Can a flow of environmental information have some impact? That an individual can change there is some anecdotal evidence. Here, for example, are the words of a wildlife expert in the Southwest, vintage 1919:

> We have to understand the real destructiveness of predatory animals on game...No refuges or regulation of game kill will get us anywhere unless these predators are cleaned out...It is going to take patience and money to catch the last wolf or lion in New Mexico, but the last one must be caught!

And here are the words of a wildlife expert in 1949:

> The cowman who cleans his range of wolves does not realize that he is taking over the predator's job of trimming the herd to fit the range. He has not learned to think like a mountain. Hence we have dustbowls, and rivers washing the future into the sea...Perhaps this is behind Thoreau's dictum: in wildness is salvation of the world. Perhaps this is the hidden meaning in the howl of the wolf, long known among mountains, but seldom perceived among men.

The writer in both cases--Aldo Leopold. Something obviously happened to Aldo Leopold in those 30 years. He called it the arrival of an "ecological conscience." I suggest environmental communication as education played a role.

II. H. Globescope-Education for Local Action on Global Issues

Donald R. Lesh, Executive Director, Global Tomorrow Coalition (moderator); Diane G. Lowrie, Globescope National Coordinator and Director, Western Office, Global Tomorrow Coalition; Thomas B. Stoel, Jr., Director, International Program, Natural Resources Defense Council, and President, Global Tomorrow Coalition.

It is increasingly clear that the combination of global trends in resource use, population growth, environmental stress, and economic development will pose serious threats to the well-being and security of U.S. citizens, and the citizens of other nations, over coming decades. The Global Tomorrow Coalition, a non-profit alliance of nearly 100 nongovernmental organizations, seeks through its national Globescope program of public education to mobilize citizen leaders to act at the community level on these issues.

II. I. National and International Networking in Environmental Education

June McSwain (moderator); Craig B. Davis, Secretary-General, International Society for Environmental Education; Charles Hopkins, Chairman, Man and Biosphere Network (MAB/NET), Canada; John R. Paulk, President, the Alliance for Environmental Education (U.S.)

Why network? How do national and international environmental education organizations develop and operate through networking? With what elements of their networking procedures are they satisfied? Where are improvements needed? Leaders of a diverse group of such organizations discussed their experiences in the area of networking in and for environmental education.

II. J. Land Resource Issues - National and Local Agendas

John Opie (moderator); James W. Giltmier, Assistant Washington Representative, Tennessee Valley Authority; Kevin J. Coyle, President, American Land Resource Association; Meg Maguire, Maguire/Reeder Ltd.

Land resource issues promise to become the dominant environmental topic for the next decade and more. Land is ultimately a limited resource which in many cases has reached its capacity for ownership, use, and development. The panelists are leading authorities in their fields and have already done much to formulate environmental policy on national, regional, and local levels. Mr. Sampson devoted his attention to debate over the nation's remaining private agricultural lands and rural communities. Mr. Coyle reported on current policy and legislative debates over public land use. Ms. Maguire reported on often overlooked environmental issues in urban land use and management. The objective of the panel was to review current thinking and debate over land resources for environmental educators.

This panel was developed cooperatively by the American Society for Environmental History and the American Land Resource Association.

II. K. Wilderness and National Park Interpretation - Current Trends

John Opie (moderator); Jean Chandler, Interpretive Planner, National Park Service; Dave Dame, Chief of Interpretation, National Park Service; Michael D. Watson, Park Ranger/Interpreter, National Park Service; Michael Paskowsky, Interpretive Planner, National Park Service.

This panel, the members of which are National Park Service leaders in wilderness and natural resources interpretation, brings to environmental educators the opportunity to review the current thinking and policies of the National Park Service. Special reference was given to public education by wilderness professionals.

(Presented in cooperation with the American Society for Environmental History).

II. L. A Controversial Issue in the Curriculum-Hunting

John R. Paulk, Tennessee Valley Authority (moderator); Cheryl Charles, Project WILD; Patty Finch, Education Director, The Humane Society of the United States; John Grandy, The Humane Society of the United States; William F. Hammond, Ft. Myers, Florida, Schools; Dan Smith, Defenders of Wildlife.

There is a range of viewpoints as to how various controversial issues are properly presented in curricular materials designed for classroom use. Spokespersons for several perspectives on one such issue, the hunting of wildlife, presented and discussed their positions.

II. M. Panel: Environmental Careers

Richard L. Perrine, University of California-Los Angeles (moderator); Odom Fanning, Science Writer, Bethesda, Maryland; Joseph M. Petulla, University of San Francisco; A. Clay Schoenfeld, University of Wisconsin-Madison; Michael M. Simpson, Library of Congress, Washington, D.C.

II. M-1. Careers in Interdisciplinary Environmental Management, by Odom Fanning

Interdisciplinary environmental management is a modern phenomenon. Now about fifteen years old, it employs approximately three times as many professionals and paraprofessionals in the mid-1980s as it did in 1970: by this observer's estimates, 1,775,000 today, up from 655,000 in only fifteen years.

Since the early '80s, there has been a sharp slackening in the growth of environmental programs due to economic conditions, tighter federal budgets, and the policies of the Reagan Administration. Even without such limitations, the exponential growth cited could not have continued for long.

Fifteen years is not a long time, and people are justified in considering environmental management to be still a "new" field. Yet, considerable turnover in personnel can occur in any field in that period. For one thing, mid- to upper level managers retire, creating openings for others.

Every emerging "new" field has antecedents, and its first practitioners invariably come from related fields. When interdisciplinary environmental management emerged in its present form, its senior managers came from the underlying disciplines that had constituted disciplinary environmental management for the previous seven decades or so. When these "seniors" retire, who will replace them?

The Bureau of Labor Statistics (BLS), in its 1984-85 Occupational Outlook Handbook, announced: "Research has produced a new method of estimating replacement needs. With increased understanding of patterns of labor force movement, it is clear that replacements are a much more important source of job openings than was previously believed."

Environmental management is no longer either "new" or "emerging;" it actually is a maturing field. Many of its top leaders and senior managers have retired or are facing retirement, and there will be more openings ahead in the mid- to upper-level management ranks than has been true at any time in the past fifteen years. This is now a trend in the major national citizen environmental organizations, six of which have named new executive heads since the first of January of 1985. The same evolution can be assumed to be happening throughout government and industry, which are the major employers of environmental managers. Research will validate whether or not this is so. And if it proves to be the case, environmental management is providing for much of its own growth, not by new funding from without, but by replacing from within.

The BLS asserts in the Handbook: "In virtually every occupation, regardless of the rate of growth, the need to replace workers who leave their jobs generates most openings."

As environmental management is demonstrably a very large field, those in it, those preparing for it, and those preparing them for it stand to benefit from those and two more observations of the BLS: "Replacement rates vary, but it is generally true that the larger the occupation, the more openings there are due to replacements. Thus, even slow-growing occupations can rank among those with the most openings."

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II. M-2. Environmental Careers, by Joseph M. Petulla

According to the General Accounting Office, about 20,000 dumpsites are eligible for Superfund grants, although other estimates place the number as high as 50,000 leaking sites. At about 100,000 total work hours per site, a conservative estimate for the number of work hours from industry, agencies of all levels of government, and consulting firms will reach at least 2 billion, and this is only recent work related to Superfund cleanups. There are at least another 30,000 underground storage tanks in the country at this very moment leaking toxic chemicals into the groundwater.

These 4 to 5 billion work hours to which the Congress and even the Administration have committed themselves do not include the several hundred thousand existing positions filled by a wide range of environmental specialists. These jobs are holding their own in numbers, and some of them relating to hazardous waste, laboratory scientists, and especially hydrogeology, are increasing at a fairly rapid rate. Even positions in industry are showing modest gains.

If there are so many jobs around in environmentally-related work, where in heavens are they? Most of us know that it is quite difficult to get into the field. Part of the problem rests with the nature of environmental education, part of the problem with the interests of the people looking for work, and part of the problem with the confused state of the field.

Many environmentally-trained people do not have enough science and math to get them into the field. Although I do not think it is a good policy, even the EPA has been hiring a great number of engineers lately, not because engineers necessarily know much about the field (I assume) but because at least they are not intimidated by quantitative problem-solving and they have some idea about what goes on in factories (where a lot of pollution is generated). Those of us who have looked closely at their curricula know that engineers mostly know how to solve engineering problems because they spend thousands of hours in engineering school doing just that. But the engineers in industry, consulting firms, and agencies, who are now doing the hiring in the environmental field, believe that once engineers know how to solve engineering problems, they can learn the rest fairly easily. This obviously is not true.

Nor is this hiring practice universally the case, fortunately, but it would help applicants to the field to know those aspects of environmental problem-solving that engineers do not generally have a background in. This means a good deal of biology and chemistry, and also a strong dose of math and computer science to enable them to talk to their supervisors. All this besides what most good environmentalists already know--how to think and write. Then they should get experience somehow, through internships or all-around hustling. And it wouldn´t hurt to get some graduate training, especially in the specialized fields through which one´s credentials are established.

II. M-3. Career Opportunities in Environmental Communication,
by A. Clay Schoenfeld

Environmental communication can be said to encompass the process of planning, producing, and disseminating, or conducting research related to written, spoken, or pictorial messages about the environment, environmental management, or environmental issues. Environmental communicators seek in various situations and ways to increase public awareness of environmental problems and public understanding of underlying basic principles, current issues, and remedial options. Some environmental communicators may go on to encourage public commitment to individual and collective action on behalf of particular types of environmental protection and enhancement.

What might be termed the environmental communication "ecosystem" includes the mass and specialized print, graphic, and electronic media; government resource management agencies at federal, state, and local echelons; appropriate professional societies; citizen environmental organizations, old and new; the resource industries and associated labor organizations; colleges and universities, particularly their extension arms, their schools of natural resources and engineering, and their environmental studies centers; and such special educational instrumentalities as nature centers, libraries, and museums. In each of these components are to be found today persons practicing environmental communication.

In The Media

The mass media--newspapers, general circulation magazines, radio, TV--discovered the environment as a social problem in 1969-70, and "what they accomplished at the level of arousing public awareness is close to miraculous in bringing to citizens scientific and social knowledge heretofore known only to a few experts," in the words of an Environmental Protection Agency official. Since the initial peak, quantitative coverage of environmental issues has declined. For example, total column inches of environmental news in sampled issues of the New York Times rose precipitously from 119 in 1962 to 1259 in 1970, and then declined irregularly to 683 in 1977. The Chicago Tribune shows a similar trend. It is likely to stay at about the present level. While the "newness" of environmental problems may have worn off somewhat, legislation like the National Environmental Policy Act and federal and state environmental protection agencies prompt sustained coverage. The environmental reporter is not without his problems: the shortcomings of biased public agencies and private experts as news sources, the bias of the reporter himself, the political and economic pressures that accompany environmental disputes, the highly technical data that can easily be lobbed over audience heads, and the pervasive problem of making a coherent whole of consensus trade-offs out of bits and pieces of conflict. Despite such problems, a new breed of sophisticated environmental newsperson seems to be doing a better qualitative job, eschewing yesterday's sensationalism for more measured investigative reporting.

Perhaps nothing so typified the irruption in environmental communication in recent years as the rash of specialized journals with the magic words "environment" or "environmental" in their titles. Some have faded from the scene, but those that remain represent a hard core of custom environmental communication media. Environmental education, for example, now has journals devoted to various aspects of research and development in ecological communication: The Journal of Environmental Education, Environment and Behavior, and Environmental Education Report. Counter-culture activists on the left have Environmental Action; card-carrying scientists on the right have The Journal of Environmental Quality, to name only five of a genre that represents the secure place environmental communication occupies today in the total media information system.

In Government Agencies

All three branches of government at all levels engage in environmental communication today. Federal, state, regional, and local bureaus of conservation, environmental protection, and land management have broadened their communication efforts in both scope and depth. Whereas yesterday their public messages were aimed primarily at boosting the particular roles of the various bureaus, today there is a growing acceptance of the particular interdependency of all conservation problems and programs, and a recognition of the compelling need for broad public understanding of that interdependency. Even the U.S. Army Corps of Engineers is engaged in a remarkable communication campaign aimed at involving the public actively in river basin planning.

Congressional and state legislature speeches and hearings today often constitute environmental communication of the most primary kind. The current debate over the reorganization of the federal resource management establishment is a case in point. Decisions by federal and state courts also add to public knowledge about environmental issues; for example, in evaluating the solvency of environmental impact statements.

In Societies and Organizations

Communication is the life-blood of the many and varied professional and voluntary associations that in turn are the life-blood of the environmental movement from the Potomac to Pocatello. Without public awareness, interest, and support, environmental action organizations could not exist, much less carry on effective programs. So communicators play leading roles in, and frequently direct, America's array of grass-roots alliances and Washington lobbies. By their very nature, such organizations frequently tend to be single-issue oriented and their communications hence are not always particularly ecological, but with few exceptions they do reflect a more comprehensive view of the environmental imperative than was the case a generation ago. For example, mark these current words from the National Wildlife Federation: "Conservation is no longer just the story of vanishing wildlife and vanishing wilderness areas. There is a new urgency in the word today. Suddenly, as we stop and look at our total environment, the word has taken on the meaning of human survival."

In Resource Industries

The resource industries have been in the conservation communication business for a long time via all manner of institutional advertisements, films, and manuals. While many of their messages admittedly were self-serving, the fact that Smokey (sic) Bear and contour plowing have been the universal symbols of conservation is testimony to the effectiveness of the campaigns of lumber companies and farm implement manufacturers.

The population-pollution-pesticide era initially caught industry off-base, and we saw a good many "backlash" messages, in the extreme the manner in which chemical manufacturers salvaged Silent Spring. But today the resource industry voice is much more statesmanlike: "Yes, there is an environmental problem, and we're part of it, but we're also part of the solution; we believe we can learn how to mesh resource extraction with environmental protection, so keep faith in us and the future." A recent study of oil and forest industry corporate image advertising, for example, suggests that, far from contaminating the essential concepts of environmental education, the oil and forest industries have in fact been captured by the environmental movement, at least as measured by their messages in national magazines.

The environmental communication record of organized labor has likewise been a mixed bag. At the national level, leading labor men and their money have played key roles in environmental education. At the local level, however, where the crunch between ecology and economics can be keenly felt, unions frequently line up on the opposite side from environmentalists. So long as the most endangered species in America is the Detroit auto worker, labor's position on environmental issues will be as excruciating to develop as it is pivotal to any kind of social and scientific entente on environmental affairs. More than in laboratories or legislatures, the next chapter in environmental communication may well be written in union halls.

In Institutions of Higher Education

Professors and students helped shape the environmental movement, and now environmentalism is re-shaping the university. The history of higher education may offer no more telling example of the interplay of life and learning in America. Invariably the early-warning-radar voices of environmentalism were those of university professors. As Aldo Leopold once wrote, ecologists live in a world of wounds, and in the early 1960s they began to cry out in force, and not just card-carrying ecologists either. What these university professors didn't have in common was a discipline; they represented a range of sciences, social studies, letters, and professions. Yet they invariably shared one characteristic: they were relatively senior, tenured faculty, secure in the campus power structure, and hence free to wander outside their specialties, engage in some holistic thinking, and coalesce around what Paul Shepard called "the subversive science" of a new human ecology which began to call into question whether old-fashioned "progress" was in fact our most important product.

Given cognitive substance by professors, the environmental movement drew its affective processes from university students. Honed to a knife edge by free-speech confrontations, civil-rights marches, and anti-war riots, campus youth of many stripes seized on "ecology" as the newest manifestation of the basic anti-materialism that was their hallmark in the mid-1960's, climaxing in a nationwide campus teach-in on "Earth Day," 22 April 1970.

Barring English composition and math, few university subjects are being offered today in so many diverse ways and places, by such a mixture of colleges, departments, and faculty, as that complex of ecology, economics, energy, engineering, esthetics, and ethics known, precisely or not, as environmental studies. No self-respecting campus is now without some gesture toward environmentalism, and the more substantial enterprises represent a major departure in university focus and format toward multidisciplinary, multi-function, problem-oriented teaching, research, and outreach. What is more, the impact of an environmental influence has actually changed the administration and management of the university, and may even yet change the common life within the university.

It is striking the depth to which environmental studies concepts have penetrated the academic structure--wholly new instructional curricula and organizational arrangements at the undergraduate level, wholly new master's degree programs, wholly new cross-discipline PhD research arrangements, wholly new extension configurations. While in some cases the changes may prove to be more semantic than surgical, there is little doubt the impact of environmental studies will long be in evidence on the broad physiognomy of the campus.

Interpreting the teaching and research and outreach activities of environmental studies faculty and staff is a growing cadre of environmental communication specialists on college and university campuses.

In Other Educational Instrumentalities

In some ways, even more striking than the university-environmental movement marriage has been the proliferation of education materials to support environmental instruction in the elementary and secondary schools. Prior to

1968 the subject of conservation was largely confined to the last chapter of the ninth-grade science text. Today the problem of the alert classroom teacher is one of digging out from under a deluge of exciting new study guides, field manuals, and filmstrips, and not-so-exciting administrative rhetoric.

The less formal educational institutions--such as libraries, museums, youth organizations, civic groups, and so on--are likewise the sites of stepped-up environmental communication. Indeed, the environmental movement has brought about the recrudescence of that special educational agency, the nature center. Various types of such centers are bringing a capsule view of spaceship earth to thousands of citizens around the country.

The largest and in many ways the most effective informal adult education activity in the United States is the agricultural extension service, epitomized by the "ag agent" in virtually every county seat in the country. Where once he was promoting pesticides, wetland drainage, sod-busting, and other deleterious farm practices, today the county agent is starting to develop lines of communication with community conservation commissions, lake protection associations, and other public and private environmental groups; and he is being backstopped by an increasing array of environmental communication materials emanating from the land-grant colleges.

Recent studies show that approximately three out of every five American adults engage in one or more educational programs of some type or other after completing their formal education. To serve this waiting audience with sophisticated environmental messages, new communication technology is emerging: state ETV networks, video-cassettes, and cable television, to name some of the most notable in being or on the horizon.

Even more intriguing, the possibility in the next fifteen years of the nation wired to coaxial cable with a two-way capacity promises to improve the level of public knowledge on environmental problems. The so-called Home Information Utility will permit individuals to command such computer-stored resources as a complete index of library information on any given environmental subject, with complete texts of books and articles, if desired; a listing of pending bills, hearings, and decisions; background information on a breaking news event; the ability to monitor a public meeting; consumer information; and the opportunity to register an opinion instantaneously in a local or national referendum on an environmental issue.

On the global front, a satellite-based community TV network for less-developed nations as large as India could conceivably become operational by 1990. Provided that the government of the receiving country cooperates, such a TV network would make possible direct transmission of programs from a so-called advanced nation into community receivers appropriately modified. The possibilities are challenging, to say the least, for a vastly broader environmental communication ecosystem.

In summary, then, for persons with appropriate training and experience opportunities are measurable in the broad field of environmental communication--as investigative reporters, as public affairs staff officers, as public information specialists, as interpreters of ecological issues.

II. M-4. Environmental Careers: Scientists and Educators, by Michael M. Simpson

It is not a recent observation that science is only part of science policy. Science policy, including policy to protect human and environmental health, is based not only upon scientific determinations, such as the measured concentration of a pollutant in the environment, but also upon policy judgments, such as the acceptable level of risk for a population exposed to dioxin. One role of environmental scientists in science policy is clear: pollutant concentrations need to be measured; chemical pathways and fates need to be uncovered; technical capabilities (such as in level of detection or speed of computation) need to be improved. In general, the environmental scientist can work to advance the science side of science policy. But there is another role for the environmental scientist in science policy.

As a specialist in life sciences in the Science Policy Research Division of the Congressional Research Service (CRS), I (and other members of CRS) provide research, analysis, and consultative services to Members and Committees of the U.S. Congress. (The views expressed here are mine and should not be taken to represent positions of the Congressional Research Service or the United States Congress). As such, I've had and continue to have the opportunity to observe first-hand the creation of science policy in the legislative arena. It is here that I've noted another crucial role for environmental scientists.

Legislators tend to be experts at legislating, at making laws. They tend not to be experts in science. Yet many of the issues they deal with arise from scientific findings: concentrations of pollutants have been measured at levels that they previously could not be; chemicals are appearing in locations and at times previously thought impossible; science is determining that potential risks to human and environmental health exist where none were foreseen. And somehow, the legislators need to go from scientific determinations (sometimes presented in terms like "parts per trillion", or "one-times-ten-to-the-minus-six") and create a science policy (sometimes presented in words like "If a...study...identifies...a significant risk to human health, the Administrator...shall take such steps as may be necessary to abate this risk)". It is here that environmental scientists can play a crucial role.

The data of scientific determinations, the warnings about the limitations of current scientific understanding, and the statements of need for further investigation need to be translated into language understandable and useful to policymakers. Policymakers need to know whether the state of scientific understanding is clear, mature, and defensible enough to form a solid foundation for a science policy, or whether the contemplated science policy needs to rely more upon non-scientific judgments.

The translated scientific statements then need to be conveyed to policymakers in the way that would be most effective and efficient. To be most effective and efficient, the translated science must be concisely presented in the context of all the issues the policymaker is familiar with; scientific statements presented in isolation, strictly as scientific statements, cannot be very effective in the policy arena. Rather, the scientific statements need to be presented as integral parts of all the issues the policymaker deals with. These issues are often in conflict, e.g., trying to reduce the Federal deficit while increasing Federal spending on pollution cleanups.

It is here, in the midst of often conflicting issues, that I've noted another crucial role for environmental scientists. Environmental scientists can have an important impact upon science policy by serving as the crucial interface between scientific determinations and policy choices. Environmental scientists can translate the scientific statements, often cold and isolated, into language understandable and useful to policymakers, and relate them to the often-heated issues the solons must deal with. To be most effective, environmental scientists in this interfacing role must be broadly trained and integrative in nature, able to cross disciplines and philosophies, to properly relate the essence of individual issues to each other, arriving at clear understandings of the relevant science and policy choices, and to convey clearly and concisely these understandings to the policymakers. In the classical sense, these environmental scientists need to be environmental educators to policymakers.

Environmental scientists can play one crucial role in science policy by working to advance the science side of science policy. Science, especially in new and developing areas, tends to be fraught with uncertainties and conflicting opinions about validity and significance--more heat than light. By working to advance the science side of science policy, environmental scientists can help increase the light-to-heat ratio.

Environmental scientists can also play a crucial role in science policy by being environmental educators to policymakers. The literal, classical sense of "educator" is informative here: "e" or "ex" (as in "exit") meaning "out of", and "duco" (as in "duce") meaning "I lead"--an environmental educator to policymakers, then, is one who leads policymakers out of scientific darkness into the light, and not heat, provided by ever-advancing scientific understanding.

There is a definite need for professionals in these two environmental careers: environmental scientists as scientists, and as the interface to policymakers.

II. N. The Role of Environmental Journals in Environmental Education

Joseph M. Petulla, University of San Francisco (moderator); Eugene C. Hargove, Editor, Environmental Ethics; J. Donald Hughes, Editor, Environmental Review; Robert E. Roth, Executive Editor, Journal of Environmental Education; Bob Strohm, Executive Editor, National Wildlife; Stanton S. Miller, Managing Editor, Environmental Science and Technology; Richard L. Perrine, Editor, The Environmental Professional; Jane Scully, Managing Editor, Environment; Lee B. Shields, USDA Soil Conservation Service.

Environmental journals educate environmental educators, scientists, policy-makers, managers, and students with a variety of approaches to the subject. Prominent editors of some of the leading environmental journals explained their purposes, methods, and audiences.

II. N-1. Environmental Ethics, by Eugene C. Hargrove

Environmental Ethics is a research publication in applied ethics. Although it deals with environmental ethics as a field in professional philosophy, it is interdisciplinary in its scope. It is considered a science publication by the Library of Congress, it is actually a humanities journal, and it is indexed as a social science journal. It has no position or set of positions that it is defending or promoting. Discussions in the journal have been instrumental in critiquing the idea that nature or the environment has rights and in separating animal liberation and environmental ethics into complementary, rather than antagonistic, sets of issues, values, and principles. The journal has a broad but thin readership around the world of about 1200 subscribers, half of which are "biological entities." In addition to the theoretical discussions that most commonly appear in the journal, the editor is interested in publishing papers dealing with conceptual clarifications of issues that arise in practice in environmental conflict. The journal is frequently associated with environmental ethics conferences. On occasion papers from such conferences are published as theme issues. Two conferences are the basis of books which will be published next year: Religion and Environmental Crisis, by the University of Georgia Press, and Beyond Spaceship Earth: Environmental Ethics and the Solar System, by Sierra Club Books.

II. N-2. Environmental Review, by J. Donald Hughes.

Environmental Review is a journal of history and the humanities; that is, it contains articles, book reviews, and newsletter items which are of interest to readers who concern themselves with the aspects of environmental studies that may be termed generally humanistic. E-ERE′ is the official publication of the American Society for Environmental History (ASEH). Articles in E-ERE′ are not only those written from a historical point of view, but often deal with such subjects as environmental aesthetics, literature, environmental ethics, wildlife, and environmental geography. Although the authors are usually professors, others have also contributed. The audience consists of educators, libraries (about 40 percent of our subscriptions), environmental scientists, staff members of land management agencies, businessmen, and the international environmental community. The journal, now a quarterly, was founded by John Opie at Duquesne University in 1976 and is now completing the ninth year of publication.

Within the pages of E-ERE′, one may find well-researched, scholarly articles written for the general reader, not the specialist. They have come through the peer review process, and their documentation has been checked carefully. Historical articles have included histories of environment and conservation in various countries. For example, an article by Sam Hays which first appeared in E-ERE′, "From Conservation to Environment: Environmental Politics in the U.S. Since World War II," won a national award, is widely used in college courses, and has been reprinted several times. E-ERE′ has also carried articles on the environmental history of other countries such as Japan, Brazil, and the Soviet Union. Subjects such as government regulation and environmental planning receive attention. While most articles deal with the modern period, earlier times such as the classical world and the Renaissance have also been covered. Recent issues on special topics have included one on "Women and the Environment" (Vol. 8, No. 1) and "American Indian Environmental History" (Vol. 9, No. 2).

A strong book review section, edited by Philip Terrie, covers the whole area of environmental studies. Included in E-ERE' is Environmental History Newsletter, edited by Bruce Piasecki, which offers announcements of conferences, publications, members' activities, and job openings.

Looking toward ER's future, we may discern some coming events and trends. Volume 9, Number 4 will be a special issue on the "Origins of Ecology," including articles on the ancient and early modern development of the science, and some etymological points on words such as "ecology" and "wilderness." As of 1 January, 1986, the journal will move from the editorship of Don Hughes at the University of Denver to that of Bill Robbins at Oregon State University, Corvallis. The momentum of ASEH will continue, since a major conference is planned for Durham, NC, in April, 1987. Like the earlier conference of international scope in Irvine, California, this should produce a crop of papers of excellent quality. All signs indicate a continued expansion in the international dimension, in Europe and beyond. The cost to individuals is $18.00 annually in the U.S. and Canada; $24.00 for institutions and international airmail subscribers. Sample copies are available by writing Environmental Review, Department of History, Oregon State University, Corvallis, OR 97331.

II. N-3. The Journal of Environmental Education: 1985 Status, by Robert E. Roth.

The Journal of Environmental Education, first published in 1969 has grown in size and stature in relation to service provided to the environmental education research and development community. With more than 1,159 subscribers annually, there are 919 domestic (U.S.) subscriptions and 240 foreign subscriptions. Membership of the North American Association for Environmental Education accounts for 177 or 9% of the total subscriptions of record.

A profile of current subscribers is as detailed below:

College and University Libraries	48%
Individuals	13%
College and University Departments	10%
Environmental Studies and Special Interests Groups	10%
Public Libraries	6%
Junior and Senior High Schools	5%
State and Government Agencies	3%
Business	2%
Other	1%

(Dec. 1983 data)

The geographic breakdown by region of the United States shows that the east North Central Region accounts for the greatest subscription rate, the mid-Atlantic states are in second place and the remainder of the country is a considerable distance behind (see below). Subscriptions by U.S. Region:

New England	67	East South Central	40
Middle Atlantic	184	West South Central	57
East North Central	207	Mountain	50
West North Central	73	Pacific	98

Canada now accounts for 97 subscriptions and other foreign countries accounted for 139.

A two-level review process is utilized, with two independent Consulting Editors reviewing each manuscript and making a recommendation to the Managing Editor. The recommendations are then distributed to one of three Executive Editors by the Managing Editor for final approval or mediation if there are differences of opinion. Forty-seven Consulting Editors with rotating terms participate with three Executive Editors.

The Journal is published four times annually by the Helen Dwight Reid Educational Foundation, 4000 Albemarle Street, N.W., Washington, DC 20016 and contains both French and Spanish abstracts of the printed articles.

II. N-4. National Wildlife Magazine, by Bob Strohm.

National Wildlife was founded in 1962 by the National Wildlife Federation, a non-profit, non-government conservation organization made up of sportsmen and nature enthusiasts from every state in the Union. The purpose was two-fold: (1) to entertain and intrigue people into reading about nature and conservation subjects; and (2) to make a net profit which could be used to fund the other educational activities of the Federation.

Circulation climbed to 500,000 by 1968, and the magazine fulfilled both primary goals. Each year it has returned a significant net profit for educational outreach programs. And every issue contains a carefully calibrated article mix which is edited to first intrigue, then entertain and educate the reader.

Most of the articles are written by free-lance writers after a detailed assignment letter is written by the magazine staff. Most of the photos are taken by free-lance photographers. The magazine staff is composed of 12 editors and 4 support staffers.

The editorial philosophy is based on the belief that many people buy the magazine, not because they have a burning desire to know about all the conservation issues of the day, but because they're intrigued with the color photography and because they feel they're contributing to a worthwhile cause. However, once they have the magazine in their home for a year, they're much more likely to renew if they've read articles each issue, some of which were primarily entertaining, some of which had new information, some of which had a new slant on important conservation topics.

The circulation is now 850,000 and the renewal rate is excellent: 75% of the people who buy National Wildlife renew it every year.

II. N-5. The Environmental Professional, by Richard L. Perrine.

The Environmental Professional is the official journal of the National Association of Environmental Professionals. Its central purpose is to provide an open forum for members of the Association and others for the discussion and analysis of significant environmental issues.

Professionals in different fields--in government, consulting, research, industry, and education--are faced with developing approaches facilitating resolution of environmental problems, problems which often cut across disciplinary and other man-made boundaries. In recent years numerous theoretical concepts, application methodologies and case studies for the analysis of such issues have been presented within diverse publications. The Environmental Professional provides a timely and single comprehensive outlet for release of such findings.

From our earliest days, we have noted that with problems of resources and the environment, perturbations in one sector inevitably impact other sectors, and not only in the immediate vicinity and time period but also in distant areas over a longer time horizon. We also note that the impact of such problems often cuts across man-made disciplinary and sectoral boundaries. We seek to define and to communicate better solutions to the numerous important environmental problems we face. And because of their transdisciplinary nature, the representative problem will share elements from the physical and life sciences, from engineering, and also from disciplines more readily seen as associated with policy--economics, political science, law and planning. Thus, while disciplines and their focused journals are an essential part of the background for each of us, we feel the need as well for a problem-oriented, as contrasted with a discipline-oriented, communication medium. While, in general, fields of science have been fissioning and moving further apart, we see a need in our areas of activity for cross-fertilization and for integration. We must develop and learn to use effectively the holistic point of view essential to ecology, to systems engineering, and to the solution of major environmental problems.

There are numerous other journals available and of value to the environmental professional--too many to list here. For some, environment represents only a small share of content. For most there is a strong disciplinary slant. Further, there is either a science or policy emphasis, but not both, and often no attempt at integration.

It is not hard to conclude that The Environmental Professional occupies a unique place within the literature. Articles with substantial interdisciplinary content are given priority for publication. Normally, reports of findings that go beyond a laboratory analysis, a field experiment, or a theoretical derivation, and further discuss the ramifications of implementation are considered appropriate for the journal. In particular, we seek studies linking science, technology, and socioeconomic systems to effective impact assessment, regulation, and hence environmental protection. We thus try to capture and analyze issues which occur at the interface of environmental science, technology and the several aspects of policy.

The Environmental Professional provides an open forum for the discussion and analysis of significant interdisciplinary environmental issues. Contributions, constructive ideas, and readership are welcomed.

II. N-6. Journal of Soil and Water Conservation, by Lee B. Shields.

I speak to you not as the editor of the Journal of Soil and Water Conservation, but as a very satisfied user. I say "user" rather than "reader" because the Journal serves a number of purposes at once--and very effectively:

- I leaf through it to keep up to date on my own field and on the many others that are part of natural resources conservation.
- I use it as a reference tool in writing about a wide range of topics.
- I use it to help other employees, their children who are students, and graduate or undergraduate students who call or write, as an "idea book" for term paper or thesis topics, as well as useful references for topics they have already chosen.
- I use it as an important outlet for my own thoughts and those of my agency, and for encouraging others to express their own views. (Example: speakers at a recent meeting said working with legislators was important, but didn't say how to go about it; with Max Schnepf's help, I was able to fill that gap with an article that appeared at the same time as three or four papers from the meeting).
- I use it to get more mileage out of chapter, regional, and international symposia, conferences, and the like. Someone who has worked hard to prepare for a meeting of 15 people or 150 people thereby also can reach 12,000-15,000 readers with the same material.
- I use it to support special conferences or special emphases in conservation programs, through special issues of the Journal or reprints--often with expanded pages, expanded advertising, and special efforts to attract government agency or private-sector funding outside the Society to support the issue or reprint. Recent examples:Conservation tillage, non-point-source water pollution control.
- I use it as a companion and support for SCSA's special publications program. Example: Remote sensing conference--news about upcoming meeting, then use of some material from the meeting, and then book review of the special publication that resulted.
- I use it as a conversation opener when talking with people about conservation issues generally, about membership in the Society, or about attending an SCSA meeting. The Journal is an excellent showcase publication.

Some special strengths of the Journal of Soil and Water Conservation:

- It has an extremely varied content, because it is aimed at more than 13,000 Society members who represent dozens of disciplines and interests. It not only discusses all these, but also helps blend them together.
- It has a unique three-in-one focus: A section of detailed technical articles about applied research in a number of natural resource conservation topics; editorial commentary by SCSA members, agency heads, legislators, industry leaders etc., about overall conservation trends; and state-of-the-art or program delivery articles that fall somewhere in between the technical and political pieces and make interesting reading for the lay person. There also is a strong section of letters to the editor where points of view can be further debated. The Journal is authoritative and highly respected.
- It has a world-wide focus and interest, based on SCSA membership and subscriptions in more than 80 countries as well as on the international responsibilities of some of the U.S. and Canadian members.
- It has had a strong editorial board ever since the magazine was founded in 1946, so all technical articles and many others are given careful peer review by board members and other technical experts.
- It is the subject of regular readership surveys, both as a specific Journal activity and as an adjunct of membership and chapter development activities, to be sure the content and approach remain right on target.

We invite your interest in receiving the Journal, in becoming members of the Society, and contributing to its programs! We need more educators in the Society. We also need more people to serve as faculty advisors to student chapters at colleges and universities.

II. N-7. Environmental Science and Technology, by Stanton S. Miller.

Environmental education runs a spectrum of information from the grade school level, through the high school and college levels, to the graduate level. ES&T is at the graduate level emphasizing environmental chemistry and engineering and is useful for the scientist, who is studying for a graduate program or working in the field as an environmental scientist.

ES&T is a monthly publication; it started publication in 1967, three years before the formation of the Environmental Protection Agency. This year it is publishing Volume 19. There are three subscription prices for ES&T. If you are a member of the American Chemical Society, the annual price is $26. The non-member price is $35 per year, and the library (institutional) price is $149. Next year, in 1986, the prices are $28, $42, and $169.

Environmental Science & Technology reports on aspects of the environment and its control by scientific, engineering, and political means. Contributed materials may appear as feature articles, critical reviews, research papers, research notes, and correspondence. Central to the evaluation of all contributions is a commitment to provide the reader with scientific information and critical judgments of the highest caliber.

ES&T has an editor, two associate editors, and an advisory board. Russell Christman, the editor, is chairman of the department of environmental sciences and engineering at the University of North Carolina at Chapel Hill, N.C. One associate editor, Philip Singer, is responsible for the water research contributions to ES&T. The other associate editor, John Seinfeld, is responsible for the air research contributions to ES&T. Singer is located at Chapel Hill with the editor; Seinfeld is located at Caltech, Pasadena, Calif. The advisory board meets annually.

II. O. Sustaining the Future-A Caribbean Example

Clinton L. Shepard, The Ohio State University, Columbus (moderator); Faustina O. de Bello, ZOODOM, Santo Domingo, Dominican Republic; Mike McGahuey, CHEMONICS, Washington, D.C.; Merilio Morell, Instituto Tecnologico de Santo Domingo, Dominican Republic; Luisa Valdez de Perez, Ministry of Agriculture, Santo Domingo, Dominican Republic.

This panel discussed the environmental and conservation education program activities for students, teachers, technicians, and farmers underway in the Dominican Republic. A general introduction to program implementation concerns in developing countries was followed by presentations about currently functioning programs provided by public agencies. Part of the presentation was in Spanish.

II. O-1. Introductory Remarks, by Clinton L. Shepard.

Every generation is inclined to believe that it lives in a period which is historically unique. In a certain sense, of course, it does. From the environmental standpoint, at least globally, the current generation may be more unique than it desires. Governments around the world are faced with the monumental task of satisfying the rising aspirations of their peoples while facing a decreasing availability of natural resources. This is particularly true in the developing countries of the Caribbean, one of which--the Dominican Republic--is the focus of our discussion today. The islands are generally small and undersupplied with the natural resources of land and energy--major contributors to the riches of their continental neighbors. Popular economic demands are generated by the tantalizing visions provided by television and radio. The tourist industry allows citizens of neighboring countries to enjoy a lifestyle which appears enviable and which poverty denies the Dominicans. Rapid changes are not always possible.

It is important to remember that the settlement and development of the Caribbean, all aspects of it, was dictated, and is still dictated, by the view which European colonizers had of the places they colonized. The physical separation of the islands and the historical result of that geography are doubly disadvantageous. The existing land-use patterns are an expression of deep political, economic, and cultural structures. These patterns do not change overnight when an ecologist or forester sounds the alarm that a country is losing its resource base. Historical experience should show us that sound treatment of the land cannot be decreed by officials and then forced upon people who do not understand why changes in their habits are necessary. As was recently expressed in Resources (Fall 83), "You cannot plant trees on the ground before you have planted them in the heads of the people."

Examples of serious deterioration of the earth's most basic resources can be found in scattered places in all nations. This includes the better-endowed developing countries, as well as the industrialized ones. The Global 2000 Report discusses the erosion of agricultural soil and salinization of highly productive irrigated farmland in the United States Extensive deforestation with more or less permanent soil degradation occurring in Brazil is widely reported in the popular literature. Even in North America and Europe, where an ecological orientation is at least perceptible, the rudimentary principles of environmental protection are understood and responded to by only a few.

Soil erosion is the most serious problem affecting the natural resources of the Dominican Republic. The country has a preponderance of shallow soils on steep slopes. This is accompanied by the widespread prevalence of slash-and-burn agriculture for annual crops. Substantial loss of topsoil due to poor practices of hillside farming has greatly reduced soil fertility and crop productivity. The task is to develop an effective means of communicating the importance of environmental conservation at all levels--from rural populations and school children, to government officials and decision-makers. This will not be easy. Everyday contact with a particular environment conditions human responses to natural, objective constraints. This contact somehow justifies the traditional exploitation which results from it. As Mostafa Tolba stated in his 1982 address regarding environmental information, "Ignorance is one of the most important causes of environmental impoverishment." If one stops to think about it, environmental ignorance is colossal even within the countries where environmental deterioration has received the most attention.

Reviewing the past decade, approximately 1973 to the present, four trends are suggested. First, scientific and popular interest in environmental protection have come together to form a new kind of conservation movement. Second, there has been a data explosion in the environmental field. Third, a new understanding of the structure and functioning of environmental systems offers a prospect of more reliable planning. Fourth, a lack of social organization, education, and training are commonly the limiting factors in environmental improvement, not a shortage of scientific knowledge.

Virtually all of us (here) are good environmentalists--at least in the talk stage. There needs to be aggressive and intelligent action, however, to face up to the enormous costs of essential conservation programs. What is needed now are programs that approach matters at the village level. Simple measures could go a long way towards reducing many problems. At the same time, they can encourage the sorts of village activities that are part of meaningful development programs. Such an approach requires imagination. It also requires a great deal of specific information regarding the local government, local customs, and local patterns of political influence. In this way the various possible programs and technologies can be adapted to the requirements of the local situation.

These kinds of activities are underway in the Dominican Republic--actions to help sustain the future. Currently the Ministry of Agriculture through its Office of Environmental Education conducts a series of workshops and demonstrations for hillside farmers. These sessions emphasize conservation practices to reduce soil erosion and increase crop productivity. Curriculum materials and inservice training are also provided for teachers at the local level. These efforts are part of a natural resources management project which receives financial support from the U.S. and Dominican Governments.

The idea of tertiary education is of particular interest. It has been demonstrated over and over again around the world that unless all conservation projects or environmental management programs include an effective education and public awareness component, their chances of achieving any long-term success are very greatly reduced. This tertiary component should include special and ancillary courses, teacher-training and refresher courses, extra-mural activities, and a wide range of training programs. All can be designed to meet particular, often more practical, requirements.

These efforts cannot be the sole responsibility of one agency or one unit within an agency. A conference on Environmental Education held in Santo Domingo in November 1982 gathered representatives from various agencies and organizations within the Dominican Republic. In addition to developing a broader base of grass roots support, it provided reinforcement for these other groups to expand their educational programs. One of these units, under the auspices of the National Park System, is the National Zoo (ZOO-DOM). Through its activities, curriculum materials for primary and secondary education levels have been developed and a series of workshops and field trips for teachers have been implemented. These programs emphasize conservation of natural resources, including habitat and endangered species preservation.

These approaches may not be new, they may not be unique-however, they are a step toward sustaining the future in the Dominican Republic. Barriers, however, still exist. These include the need to get the message across to a population with a high illiteracy rate, overcoming the vested interests of the urban elites, reversing the lack of imagination exhibited on the part of national and international aid personnel, and providing for the families of farmers while new practices are being implemented.

Nobody pretends that conservation education alone can solve the complex and serious environmental problems which surround us. But the programs discussed today to increase awareness and understanding have to be a step in the right direction.

II. O-2. The ZOO-DOM and Ten Years of Environmental Education,

by Faustina O. de Bello.

With the knowledge that "education is the only thing which will save mankind," as was stated by a great Uruguayan psychologist in his book "Sicologia de las Vacaciones" (Vocational Psychology), and conscious as well of the deterioration and destruction which were devastating the natural resources and scio-economic development in the Dominican Republic, there came about a series of developments which from the beginning had as their final goal the formation of educational departments, in order to try to inform people who would be more conscious and capable of taking favorable attitudes, to maintain and widen our culture, and to make rational use of our resources. Museums, libraries, a big national theatre, and (better yet) extensive areas for the botanical garden and our zoo park were constructed.

In 1972, the physical construction of the ZOO-DOM was formally initiated, and by the summer of 1973 the first training course for teachers in the Department of Environmental Education was concluded, in which participated students of biology, education, chemistry education, and biology education, all coming from the nation´s universities. The course was conducted by the already existing staff of the new zoo park, as well as the O.E.A., the organization in charge of bringing to a happy end all the activities related to the construction and management of each one of the zoo´s areas, education in particular.

The teaching staff selected to work in the ZOO-DOM was trained directly or indirectly by the San Diego Zoo, to which our park gives infinite thanks for all which it did for the preparation of our staff.

In 1975, the new Santo Domingo Zoo Park was inaugurated and had at the heart of its objectives, which would sketch the guidelines and work techniques to be developed, the intention of serving and educating the people:

1. To provide recreation to the nation´s adults and children;
2. To facilitate the study of different species of animals;
3. To contribute to the study of ecology and ethology (ecological habitats) of the native vertebrate species (excluding fish) in the different Dominican ecological formations;
4. To serve as a practical laboratory in the areas of zoology, botany, genetics, and ecology for the programs which are carried out in the primary and secondary schools, as well as in the universities;
5. To cooperate with the students and teachers in the different educational institutions and levels in the carrying out of works of investigation;
6. To invite scientists of high national and world reputation in the field of natural sciences, especially in the areas of ecology, zoology, genetics, and botany, for the celebration of conferences, seminars, roundtable discussions, etc., with the participation of Dominican teachers in these disciplines; to develop interest among young Dominicans towards the important and necessary careers of biology, zoology, botany, genetics, and ecology.

In compliance with this last objective, in February 1985 we were honored with the presence of Dr. Augusto Medina, representing two pillar institutions in the area of conservation--RARE Inc., and World Wildlife Fund-U.S. Dr. Medina gave a course on methods of environmental education to a group of technicians and professionals representing institutions related to the ZOO-DOM, with similar objectives; some of these institutions are Cibima, USDA, Ministry of Agriculture and its departments of fishing resources and environmental education, as well as museums, the botanical garden, the District's town council with its Department of Adornment, and the Ministry of Education. The results of this course have been satisfactory because inter-institutional work has increased, and united efforts are always more positive than individual efforts.

Departing from the objectives mentioned, we believe that the basic functions of the ZOO-DOM in relation to environmental education are to be an "educational organism of multidisciplinary character with projection at institutions of primary, middle, and higher education, concerning natural sciences and related areas...To promote scientific, cultural and educational activities aimed at the preservation development of the diverse resources which constitute our national heritage...To generate activities of great interest for the country which would permit an adequate usage and enjoyment of the natural resources, especially those related to the protection of the Dominican fauna and the important part it plays in the transformations of material and energy necessary for human life."

Complying with the ZOO-DOM's functions, the Department of Environmental Education was brought into action in 1974. The teaching staff of this department prepared instructional guides and put them into execution in the schools and colleges of the peripheral areas of the ZOO-DOM. We thank the people in those areas who served as a trial run for us, in order to be able to offer environmental education for the first time in the Dominican Republic so useful and necessary to all nations, especially those in development.

Awareness education in favor of the environment has not been limited within the boundaries of the National Zoo Park; we have extended our general environmental education program to different localities in the country's interior, taking into consideration the magnitude of the environmental problem in those areas. In fact, we always direct ourselves towards the regions which, from the point of view of conservation, have the greatest needs upon finding their ecosystems in critical conditions. In truth, a great number of our large national landscapes find themselves in disfavorable conditions and as a consequence, the conservationist message has been reaching the different corners of the Dominican Republic. Within the general environmental education program there are two sub-programs:

1. A program of permanent education which covers all levels of Dominican education (maternal, pre-school, primary, intermediary, secondary, special education for handicapped and socially disadvantaged children, as well as university). In this program we develop different topics on animal life, ecology, environmental conservation and the importance of the National Parks. This program makes use of a diversity of educational materials such as videos, films, slides, charts, posters, and the National Zoo Park's own natural environment.

Through this program, our Department of Education receives an average of 70,000 students annually which represents approximately 300 pupils daily, without counting out-of-school people who utilize the educational tours. In the latter, the participant receives information on the animals in the ZOO-DOM and information on environmental education. The basic objective of the educational tour is to make the individual aware of environmental conservation and to establish the knowledge which the students have acquired in the ZOO-DOM classrooms.

The team of guides which leads the educational tour is made up of university students from the area of natural sciences, and they are both selected and trained by the Department of Education.

2. The other environmental education program which we have is directed at distinct sectors such as professional technicians, ecological societies and conservationist groups, teachers serving the private and public sector, students of education, journalists, soldiers, peasant associations, and skilled foresters.

The main objective of this program is to train the individual participant so that through the knowledge of environmental education the individual can use his conscience and react positively to environmental problems and participate actively in the socio-economic and cultural development of his community.

This program's principal method of training the individual is with short courses, from three days to a week, on environmental education methods and conservation of natural resources.

When we conduct a course in the country's interior with whichever of the mentioned groups, we make it available to the community by way of slides and films related to the environment which are shown in the community's municipal park, with the involvement of other groups and educational levels.

Another way of reaching the public is through articles and presentations in the different communications media, such as radio, television, newspapers, etc., as well as round-table discussions, symposiums, workshops, seminars, and expeditions.

One of the ZOO-DOM's most complex environmental programs is that which is carried out with the peasants in the peripheries of the National Park, because these people constitute a social-political problem, owing to economic difficulties. The program is based on alternatives aimed at resolving some of their needs, with the goal of maintaining the natural landscapes. Among these alternatives, we have the construction of Lorena stoves, small nurseries, techniques for the planting of cultivations, advisement on the use of forests, etc.

Through this program we are able to incentivate these peasants to make use of the information which we provide them in the lectures, meetings, and environmental education courses of elementary level. Each National Park has one or two educators in charge of implementing the Program of Environmental Education. Unfortunately, we feel that we will be forced to suspend this program since the funds assigned to it were discontinued.

In the universities, the Environmental Education Program is developed with the students of Agricultural Education, Biology, Biology Education, and Chemistry Education, and the students which participate in environmental education courses serve as multiplying agents in each of the communities to which they belong. As a result of this training, numerous Ecological Associations have been created in different areas of the Dominican Republic, with the aim of forming an ecological society in each of the nation's towns.

Another important area in which the ZOO-DOM is involved is in relation to environmental education for university students, which is carried out by the Veterinary Department in coordination with the Department of Environmental Education, with students from some of the nation's veterinary schools. In this program not only are clinical aspects and management of wild animals included, but ecological and conservationist aspects as well. The ZOO-DOM's aim with this program is to receive at least six groups each year, with the goal of developing abilities and skills in the management of wild animals and to encourage love and respect for them, as well as their conservation in nature.

Until now we have been receiving an average of 90 students per year, which represents a high percentage of the graduates in the mentioned area from the nation's different universities.

In May 1984 an environmental education program was initiated aimed at conserving the sea-turtles which reach the coasts of the Dominican Republic. The educational material was prepared by RARE Inc. and the Correspondence University of Costa Rica, and has been well received by the educators and fishermen of the nation's coasts, as well as by the Marine-guards. The material was distributed by the ZOO-DOM by way of its Department of Environmental Education. Before delivering it, a professor explained to the groups its methodology and use, in order to try to achieve the proposed objective. According to the information which was obtained after the distribution of the material, we can firmly state that we have achieved a high percentage of the objectives since many people have intervened in the sale of turtles and their out-of-season capture. In addition, some have been taken to the ZOO-DOM.

ZOO-DOM Achievements

The achievements obtained through our activities have been until now acceptable, since we have achieved the formation of 12 ecological societies and we have developed a total of 73 courses, with a participation of more than 6000 individuals covering different sectors of the population. The ZOO-DOM always has more than three courses solicited per month. Unfortunately, we can not comply with all of them, but we try to maintain the enthusiasm for the good of our programs and the nation. One of the most important things we want to accomplish is the evaluation of these courses, but the economic resources do not allow us to realize this as we would like, rather we are initiating it by way of mail-in questionnaires, which actually shed little light since not everyone fills them out.

In 1981, together with the Pedro Henriquez Urena National University (UNPHU), the ZOO-DOM celebrated its first seminar on Environmental Pedagogy and Conservation of Natural Resources, with teachers and students of teaching which brought about conclusions tending to put pressure on the authorities of the Ministry of Education to modify primary and intermediary education programs to include ecology themes, something which thanks to these pressures from our Department and other similar institutions is today a reality.

Immediate Activities to be Developed for 86-90

As we are firm believers that environmental education should be developed at all levels, we have developed two environmental education projects:

The first, for public and private primary schools, with the objective of having the students acquire actual knowledge on ecology, and become aware of the environment and their relation to it. For this, the teaching staff of the Department of Environmental Education will visit the educational institutions and for two hours will give lectures on the environment to each of the different primary levels.

The second project is the most ambitious of all because it proposes the training of teachers serving the public sector on environmental education methods. This project is very advantageous for the country but very costly for the ZOO-DOM, for the which it needs national as well as international aid in order to be able to realize such an ambitious program. In spite of all this, we have already trained more than 700 teachers with courses on environmental education methods and conservation of natural resources so far this year, 1985.

At this time the Ministry of Education has in its hands a proposal which was formulated by the ZOO-DOM's Department of Environmental Education, on what it understands to be behavior towards the reforestation of the Dominican Republic. The following points can be found in the proposal:

1. That the primary student be obliged to plant fifty baby trees in order to be able to pass to secondary education;
2. That the middle-level student plant 400 young trees in the period of his secondary education;
3. That it be demanded of each university student to plant 100 young trees (with credit if possible) as a requirement for obtaining a university degree; and
4. To provide schools with nurseries made by teachers and students, in order to fill backyards and streets with greenery.

I have presented a general summary of what has been the environmental education work developed during 10 years by the Department of Environmental Education of the National Direction of Parks, located in the ZOO-DOM. That has been possible thanks to the effort and dedication of the teaching staff and the cooperation of institutions such as; The Ohio State University, Washington Zoo, Philadelphia Zoo, Metro Zoo, San Diego Zoo, RARE Inc., and WWF-US.

What is most important from all this is that you get a general idea about what we have realized until now with the hope of doing something more in the future, in pursuit of a better environment and consequently a better nation.

II. 0-3. Working with Dominican Teachers, by Luisa Valdez de Perez.

Man should understand the simple fact that he is absolutely dependent on his environment. He must become aware that he is affected by his environment and that he also affects it. According to William B. Stapp, "Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems, and motivated to work toward their solution." Man should develop and maintain a high quality system; special considerations are important when he uses natural resources. These natural resources serve him in many ways and their inefficient use and management affect the total environmental system. This implies the need for a body of factual knowledge which motivates individuals to act positively toward their environment. Environmental Education (EE) can help provide this factual information and help develop the actions necessary for environmental quality. In the Dominican Republic, teachers can play an effective role in achieving these goals by incorporating EE into existing curriculum structures. Teachers have a responsibility of doing all they can to promote EE outside of, as well as within, the formal educational structure.

Serious deficiencies affect the Dominican educational system, due to socio-economical, political, and environmental problems. Our schools are subjected to stresses of a population that demands the eradication of poverty, and the fulfillment of their basic needs. Also, environmental degradation urges government agencies and non-government organizations to educate and inform these people about the effective management of natural resources. The Ministry of Agriculture through its Department of Environmental Education (DEA) deals with such issues and encourages people to improve their quality of life.

Problems Facing Teachers

Educational systems should be organized around the goal of teaching children to function as effective agents for change. In this aspect, EE becomes a fundamental part of the school task to involve students in the critical analysis of the social values and interactions that underlie environmental degradation. Currently our natural resources are being rapidly depleted by deforestation, soil erosion, habitat destruction, and so on. Students must be aware of such environmental problems and develop the ability of finding alternatives to solve them.

Dominican teachers face many problems when they want to introduce EE activities into the formal educational system. First, some teachers feel that the environment is important but they are afraid of having too little knowledge about it to teach it. Second, teachers have different interests, environmental perceptions, and concerns. New methods of professional training may be one way to help teachers, both pre-service and in-service, to implement different approaches to teaching. One approach that is effective is to help develop the essential skills for decision-making. The DEA does this through panel discussions with teachers and students who attend workshops.

Other problems have been identified that are affecting a successful effort directed toward EE through instructional programs. These include a general lack of:

(1) a coherent philosophy of EE among educators;
(2) teachers interest and background in EE;
(3) existing programs focused on EE;
(4) well-developed instructional materials and textbooks oriented to EE; and
(5) individuals trained as EE consultants.

All these problems are affecting Dominican instructional programs because EE is relatively a new entrant into education curricula. Nevertheless, solutions are being implemented:

First, the Ministries of Agriculture and Education are embarking on a comprehensive EE program to span the curriculum and to link subject areas related most closely to the environment;

Second, effective methods of implementing EE into school systems are being developed to assist future citizens to obtain the knowledge and incentive necessary for making informed environmental decisions;

Third, efforts are made to provide teachers with the background knowledge and specific teaching abilities necessary to assume their role of leadership in EE activities;

Fourth, adequate materials and facilities to develop education programs are being made available by the DEA to teachers in elementary and secondary schools;

Finally, technical assistance (which is sponsored by the NARMA--National Resources Management project) is being provided by The Ohio State University (OSU). Currently, there are four Dominicans who are graduate students in the OSU School of Natural Resources.

However, specific and effective programs and the tools for their implementation need to be developed formally. Because of the absence of an organized program of EE in Dominican school curricula, instructional programs must be developed to promote environmental awareness and attitudes. As a result, teachers are being trained to incorporate EE programs in the existing curricula. Sequentially developed and logically integrated training programs are developed by the Department of Environmental Education (DEA). These programs provide teachers with a basic environmental awareness and an ecological consciousness. Similarly, continuing pre-service and in-service programs can aid teachers in acquiring competence and provide useful tools to include EE in school curricula. Some teachers do not have either the interest or ability to integrate some environmental concepts into their curricula. This fact helps reveal the need for teacher training at all levels. This training should include the development of conservation programs and interpretive materials. These will be most useful if adaptable to local situations and the objectives of varying courses.

How to Implement EE in Schools

A well-organized program can give teachers the incentive and background necessary for implementing an effective EE experience. A program of this kind, as developed in the Dominican Republic, should follow these recommendations:

1. To develop teacher workshops and in-service training programs which provide efficient techniques for EE implementation. Continuing in-service programs aid teachers in acquiring competence, feeling secure, and being more confident in their ability to teach about EE issues. Trained teachers can develop operational and logistical ideas for the curricula. Workshops and field trips organized by the DEA help teachers to develop curriculum materials related to environmental issues.

   A series of EE seminars and workshops-- sponsored by the NARMA project--are being developed by the Department of Environmental Education in Santo Domingo. These are concerned with education of teachers, technicians, farmers, and general public to the total environment, and specially with the management of natural resources. all groups have been responsive to these activities.

2. To develop pre-service instructional programs to promote an environmental awareness and sociological attitude in teachers. In this way, they will be able to incorporate EE activities into the curriculum. DEA develops and teaches courses to help future teachers to implement EE activities.

3. To implement a program to develop an attitude of responsibility and an academic commitment to a vital, interdisciplinary, integrated, and modular curriculum in EE. Such a program would have an inherent capacity for allowing teacher modification so that the specific needs of their students are met without destroying the validity of the total program. So, DEA had issued "Guia de Educacion Ambiental para la Escuela Primaria" to help teachers doing this task.

4. To create a well-coordinated team approach toward developing a science curriculum in the school system. An DEA team is in charge of training teachers who will incorporate and coordinate EE activities into a general curriculum. It is possible due to an agreement between the Ministries of Agriculture and Education, although no funds are currently available to incorporate EE activities into the national curricula.

   Teachers, supervisors, and professional scientists can share thoughts and ideas and prepare a structure for curriculum design based on ecological relationships and environmental awareness. Team teaching involves teachers with a variety of backgrounds working in close cooperation with each other. Also, students can work together on environmental problems which interest them. This provides valuable learning experiences.

5. To introduce course material, educational and work study programs, environmental research, and curriculum requirements to stress overall environmental problems in an informative and comprehensive manner. EE materials developed by technicians from DEA are available to alleviate teacher insecurities. Posters, brochures, stickers, books, and other written materials are given to participants in DEA workshops. Work-study programs and environmental research, on the other hand, have been introduced into Dominican University programs.

6. To try reasonable alternatives to solve financial problems for training and materials. These problems can be solved when administrators become aware of EE needs and problems. So, it is necessary to show them the benefits of EE activities. In addition, activities and work projects organized by teachers and students could supply funding for EE experiences and materials.

7. To involve representatives from the educational, economic, and social community in EE activities. DEA encourages teachers, parents, and other community members to embark on campaigns to demonstrate how EE can be effective to meet the local goals. Many community resources (e.g.,

people, funds, and field study sites) can be utilized to enhance and support EE programs.

Conclusion

An educational approach that effectively educates students concerning their relationship to the total environment is a need today in Dominican schools. Teachers should support and perform a main EE goal by working with their students to be knowledgeable regarding environmental problems, aware of how to solve them, and motivated to act effectively toward the solution of such problems. It implies that teachers must have a combination of factual knowledge and motivating interest or attitudes toward EE. This results in a tendency by teachers to work to develop an effective role in achieving the EE goals.

The DEA courses for teachers conform to a basic series of conferences, slide presentations, field trips, working groups, and panel discussions. Involvement is important. Participants discuss common problems that they face in primary, intermediate, and secondary grades. Then, they report on their results the needs, problems, and alternatives of solutions to implement EE in their schools. Teachers are provided of some supplementary, educational materials to be used as a reference for their programs. Nevertheless, it is necessary that an instructional department at the Ministry of Education elaborate and compile an adequate index of materials to be used for EE activities.

The United Nations Conference on Human Environment in Stockholm, Sweden (1972), agreed as to the need for establishing an international program in EE, interdisciplinary in approach, in school and out-of-school, encompassing all levels of education and directed toward the general public, to manage and control the environment. So, effective methods of implementing EE into school systems must be developed. It is essential to our political and socio-economical system, because individuals have to make environmental decisions. Our school systems must fulfill their responsibility to society and accomplish the EE goals proposed at Stockholm. Also, training must be available to provide teachers with the background knowledge and skills necessary to assume their role of leadership in EE experiences. We in the DEA are working to fulfill that goal.

II. P. Symposium: Wilderness and Coastal Wetlands, Ways They May Sustain an Impoverished World.

Joseph V. Siry, Rollins College, (moderator); Kathleen Blanchard, Atlantic Center for the Environment; Gregory A. Breese, Tinicum National Environmental Center; Armando da Silva, Towson State University; Ann Galli, Hackensack Meadowlands Environment Center; Karen Harding, Ft. Steilacoom Community College; Gary Heath, Maryland Department of Education; William S. Portlock, Chesapeake Bay Foundation; Emmett L. Wright, Kansas State University.

Session I - Global Issues in Estuarine Preservation

II. P-1. Land Use Changes and Nutritional Bio-productivity Mapping in a Hong Kong Wetland Ecosystem, by Armando da Silva.

Synopsis

The rural landscape of northwest Hong Kong comprises a landscape mosaic of mudflats, ricefields, fishponds, and vegetable-plots. This paper is about land use succession in a small coastal valley now dominated by successful fishponds.

In the early years of this century, this valley, called Tin Shui Wai, was but an extension of the sea, a small, shallow tidal mudflat of the Chu-jiang estuary in south China. The former mudflat has been reclaimed to fishponds. This change in the patterns of land use allows a methodology of looking at wetland succession tied to spatial changes in the nutritional bio-productivity of the land. This bio-productivity is mapped for changes in Food Energy (Calories), Fat, Protein, and Carbohydrates. As land succession, in space and in time, proceeded from original mudflats, to single-crop brackish water ricefields, to double-crop fresh water ricefields, and to fishponds, corresponding spatial changes in the four basic food measures are documented in maps. This approach in looking at the bio-productivity of wetland ecosystems affords cross-comparison with similar coastal ecosystems elsewhere, and could be seen as an applicable methodology in environmental education.

Methodology

The spatial expression of agro-ecosystems modified by humans can be termed agricultural land use. Such use can be conceptualized as the human imprint on the landscape. Land use is mappable, and this mapping is traditionally a salient feature of cultural biogeography.

Land use, too, can be assessed according to biomass production. This assessment involves converting crop-yield at harvest-time into quantitative unit-yields as "pounds an acre," and "kilograms per hectare." This methodological approach allows one to compare mosaic landscapes by using food values of crop-yield as the common denominator. By so doing, land use changes and agricultural biomass production can be synthesized within a single framework.

Techniques

Two problems had to be addressed. One is to document land use change. The other is to assess, in the field, agricultural biomass production in terms of biomass-space-time, expressed commonly as yield per area per year.

Publicly available land deeds, survey maps, topographic sheets, and aerial photograph mosaics on file at the Hong Kong Government Land Survey Office and the Hong Kong Government New Territories Administration Office allowed one to document historical land use succession at Tin Shui Wai Valley. Overlay tracing of maps and aerial photograph mosaics were made. The scales of these overlay tracings were then standardized by routine cartographic means to produce a uniform base map. This base map could now be used to record sequential land use changes.

On site observations, field interviews, and participation in harvest operations undertaken over a year among oyster-gatherers, rice-cultivators, fishpond operators, and wholesale buyers of local agricultural products established acceptably accurate crop-yield estimates. Local crop-yield values were converted to metric notation, expressed as kilograms per hectare per year.

Once crop-yield estimates were established, it was then possible by the use of local food conversion handbooks and pamphlets to translate unit-weight of each harvested crop into the four basic nutritional components of Food Energy, Protein, Fat, and Carbohydrates. These components can now be mapped to record nutritional bio-productivity to accord with spatial changes in land use.

Land Use Chronology

Over the span of seventy-five years, Tin Shui Wai Valley has undergone momentous social, economic, and environmental changes. In the early years of this century, the valley consisted of mudflats criss-crossed with tidal creeks from which oysters were collected in autumn. In the 1920s, a bund was constructed across the inlet of mudflats to reclaim it for brackish-water ricefields. By the mid-1950s most of the impounded land was given to the growth of this unique rice. From the viewpoint of wetland ecology, the entopic shift in half a century from non-grain to grain-growing land resulted in more food for human consumption.

Once single-crop brackish rice cultivation became possible, then eventually double-crop fresh water rice cultivation followed as an historical-cultural sequence of land reclamation. This process, at one time common throughout the wetlands of the Chu-jiang estuary, afforded a two-and-a-quarter-times increase in food value per unit area. The modification of one hectare of brackish water ricefield, for instance, to a fresh water one, entailed a *net* gain of 14.22 x 10^6 kcal of food energy, 296.25 kg of protein, 75.05 kg of fat, and 3057.10 kg of carbohydrate.

The traditional process of local reclamation of mudflats thus followed this historically recognizable pattern; first of oyster gathering from mudflats, then of single-crop brackish water rice cultivation, then of double-crop fresh water rice cultivation. Each step along this progression allowed agricultural intensification to occur, while at the same time setting a larger food base for the area.

Just as fresh water rice cultivation was being stabilized as the agricultural norm for the locality in keeping with reclamation tradition, pressure for land use change came.

Following upon the founding of a revolutionary communist government in China in 1949-1950, refugees swelled into urban Hong Kong. The continued growth of people into industrializing, urban Hong Kong created demands for local fresh fish and fresh greens. People had more money to spend and in the Hong Kong of that day money was to be spent on good eating. Good eating among Hong Kong's Cantonese-speaking residents meant eating fresh fish and fresh vegetables. The impetus was set for land use change at Tin Shui Wai Valley.

As vegetable and pond fish carried more money per unit area than rice could, more and more prime ricefields were turned into vegetable-plots and fishponds. Since the 1970s fishponds have dominated the landscape of the valley. These fishponds, with their relatively high yields per hectare, are sustained and maintained by large infusions of nutrients through inputs of urban excreta and of commercial feed.

The insistent argument derived from old local tradition that tillable land should best be retained as ricefields as much and as long as possible is persuasive from a nutritional viewpoint, though not from an economic one. Contrary to popular belief, a ricefield can yield more protein than a fishpond of similar size! A double-crop ricefield is capable of producing more food energy, more protein, more carbohydrate, but little less fat, than a commercial mullet fishpond, assuming average annual economic yields of 7100kg/ha/year for fresh water rice, and 2310 kg/ha/year for mullet. The following table affords this comparison.

Comparable Food Value: Fresh water rice and Mullet

	Food Energy (kcal x 10^6)	Protein (kg)	Fat (kg)	Carbohydrate (kg)
Mullet	3.37	452.76	159.39	-0-
FW rice	25.56	532.50	134.90	5495.40

Economic considerations, and not just aquacultural factors, will once more determine the future land use of Tin Shui Wai Valley. While fishponds still dominate the landscape there, their days are numbered. Plans have already been drawn by land developers and approved by the government to completely fill existing fishponds for urban high-rises. Sic transit gloria.

II. P-2. A Superfund Case Study: Commencement Bay, by Karen Harding.

One of the ten most polluted sites in the United States is located in the midst of the beauty that is the Pacific Northwest. Commencement Bay is home to recreational boating, commercial and recreational fishing, and industry. It encompasses the dredged and filled delta of the Puyallup River and portions of the southern Puget Sound shoreline adjacent to the city of Tacoma, Washington. In an area known for its scenic beauty, industry was believed to be in relatively peaceful coexistence with the environment. This image was shattered when the U.S. EPA listed Commencement Bay among the ten most polluted areas of the country. Since then, Federal funds have been made available to study the area through the Comprehensive Environmental Response and Compensation Liability Act (Superfund).

The Commencement Bay area achieved its place among the most polluted in the country for different reasons than most other hazardous waste sites. Rather than having high concentrations of just one or two toxic chemicals, the area was found to contain moderate amounts of many different compounds. Historical studies had shown that some biological damage had occurred, but it was unclear which of the contaminants were responsible for the damage (Nicola, 1982). Indeed, it seemed likely that the damage was caused by one chemical in one area and another chemical in another area (CH2M-Hill, 1983). The problems in Commencement Bay were made worse by the fact that, for many of the contaminants, little or nothing was known of their biological effects or environmental fate. The physical, chemical, and biological complexity of the area required new techniques for studying the area and for analyzing the results. This paper presents an overview of the study conducted in the Commencement Bay area under the Superfund legislation. In addition to being a case study, it provides some general information about a methodology for studying and cleaning up an area that is contaminated by many different chemicals from a variety of different sources.

The Commencement Bay study area covers approximately nine square miles and includes parklands, on- and off-shore fishing areas, water-based recreation areas and seven industrialized waterways. Industrial concerns in the study area include a pulp mill, scrap metal refineries, chemical manufacturers, oil refineries, ship building and repairing facilities, and aluminum and copper refineries. In total, there are about 90 industries that are potential sources of pollution (Tetra-Tech, 1985c). In addition, there are 334 drains, seeps, or open channels that could potentially bring contaminants into the study area (Tetra-Tech, 1985c). Prior to this study, about 150 organic and trace metals had been identified in the Commencement Bay study area (CH2M-Hill, 1983). Many of these contaminants were known to be carcinogenic, mutagenic or bioaccumulative (CH2M-Hill, 1983). Other studies had suggested that biological damage seen in crabs, shrimp, and bottomfish correlated well with the concentration gradients of certain of these contaminants (Nicola, 1982).

The investigation supported by Superfund was directed toward four main goals. These were to 1) determine the areas of elevated chemical contamination, 2) determine the extent of biological damage, 3) correlate elevated chemical contamination with observed biological effects, and 4) identify the sources (historical and on-going) of the various chemical contaminants (CH2M-Hill, 1983). The procedure for each of these is described below.

Surficial and subsurface sediment samples were analyzed for more than 150 different chemicals. The chemicals present and their concentration gradients varied markedly from one waterway segment to another. Some chemicals were only slightly elevated over reference values, while others were detected at concentrations one thousand times higher than reference values (Tetra-Tech, 1985b).

Biological testing was done on a portion of the sites in the study area. The biological testing was of four different types; there were studies on sediment toxicity, bioaccumulation, benthic population, and fish histopathology.

Sediment toxicity studies were conducted on two different organisms: amphipods and oyster larvae. Amphipods were exposed to sediment samples for a period of 10 days and the number of individuals that survived were counted. In the other toxicity study, oyster larvae were exposed to sediments for a period of 48 hours and the number of abnormal and normal individuals were counted. The sediments were found to be toxic in one or both of these bioassay in 24 of the 52 areas studied (Tetra-Tech, 1985). The second type of biological testing involved studying the benthic macroinvertebrate assemblages. The total number of species present and the number of individuals in each species were recorded. The overall population of benthic organisms was found to be decreased in many areas of Commencement Bay. The diversity of species was also found to be decreased in a number of areas (Tetra-Tech, 1985a). The third type of biological study involved bioaccumulation. The livers and muscle of English sole and cancroid crabs were tested and six different compounds were found to have bioaccumulated (Tetra-Tech, 1985a). In the fish histopathology studies, researchers looked for four types of lesions thought to be related to degenerative changes. All were found to be more common in the Commencement Bay study area than in the reference area (Tetra-Tech, 1985a). In short, biological damage was evident in many parts of the study area.

For those areas that had chemical contamination elevated over reference values, an Apparent Effect Threshold (AET) was defined. The AET is a concentration of chemical contaminant, above which biological damage is always seen. The date on the concentration of chemicals present and the biological effects were also combined to give a numerical value signifying an overall ranking of environmental significance.

Although the clean up effort could easily have been directed at the areas with the greatest environmental significance, it was decided that further prioritization was appropriate. This involved identification of the sources of as many contaminants as possible. Source identification was considered a priority because it could lead to recovery of clean-up costs from those parties found to be responsible. Therefore, to direct the remedial monies at those areas where they could potentially do the most good, a final ranking of the segments of the study area was done based on three criteria. Equal weight was assigned to environmental significance, spatial extent of the problem area, and confidence of source identification (Table I). High values (4) correspond to the highest levels of environmental significance, the largest area affected and the greatest confidence in source identification. This final ranking will be used when and if remediation monies become available.

TABLE I. FINAL RANKING OF PROBLEM AREAS

Segment Containing Problem Area	Environmental Significance[1]	Spatial Extent	Confidence of Source Identification	Total Score
CIS	4	4	4	12
RSS2	4	4	4	12
SPS1	4	3	4	11
HYS5	4	3	4	11
SIS1	4	4	3	11
HYS1	4	4	3	11
HYS2	4	2	4	10
CIS2	4	1	3	8
MDS1	3	3	2	8

[1] Scale: 1 = low level of environmental significance;
4 = high level of environmental significance

While the actual clean-up of an area such as Commencement Bay may itself be quite complicated, this study identifies ways to deal with a site contaminated with a variety of chemicals. It is likely, therefore, to be used to evaluate other sites which are contaminated with a number of different chemicals. The methodology also provides a reasonable way to assess the relative importance of any given contaminant to observed biological effects. For those compounds where little is known of their environmental fate or their potential for biological damage, the Apparent Effect Threshold values that were defined in this procedure may prove to be a useful starting point for further study.

While some might argue against prioritizing clean-up based on identifying the source of the contamination, the procedure as outlined above does help insure that the maximum amount of remedial monies will be made available. The procedures for collecting and analyzing data used in this study seemed to function quite well. In sum, this methodology worked well in Commencement Bay and is likely to be very useful in the investigation of other hazardous waste sites where many contaminants may be present and where the extent and kind of biological damage varies from one segment of the study area to another.

References

CH2M-Hill, commencement Bay Cooperative Agreement Work Plan and Budget. Prepared for Washington Department of Ecology and U.S. Environmental Protection Agency by CH2M-Hill Consultants, 2/8/83.

Nicola, Bud. "Assessment of Health Risks Associated with the Consumption of Bottomfish Caught in an Industrial Bay." Paper presented to the American Public Health Association, 1982.

TPCHD. "South Tacoma Historical Study." Prepared by Tacoma Pierce County Health Department, 1980.

Tetra-Tech. Commencement Bay Nearshore Tideflats Remedial Investigation, Volume I: Chemical and Biological Testing. Prepared for Washington Department of Ecology and U.S. Environmental Protection Agency by Tetra-Tech Consultants, June 1985a.

Tetra-Tech. Commencement Bay Nearshore Tideflats Remedial Investigation, Volume II: Source Identification. Prepared for Washington Department of Ecology and U.S. Environmental Protection Agency by Tetra-Tech Consultants, June 1985b.

Tetra-Tech. Potential Remedial Technologies for the Commencement Bay Nearshore Tideflats Remedial Investigation. Prepared for Washington Department of Ecology and the U.S. Environmental Protection Agency, June 1985c.

II. P-3. The Global Importance of Restoring the Chesapeake Bay, by Joseph V. Siry.

The Chesapeake Bay has been at the heart of national development from 1607 until today. From the founding of the Virginia and Maryland colonies and the formation of the republic to the environmental legislation of this century, the bay's resource development problems have forced us continually to redefine national goals and priorities. The current uses of the bay are overly enriching our largest estuary with nitrogen, phosphorus, and chlorine. Estuaries are regions where the rivers' fresh flow spills over the saline seas, so that tidal flood and physical and chemical factors act to trap nutrients, sediments, and toxic contaminants, instead of diluting transported materials.

Consequently, nutritious sea grasses that sustained the bay's fisheries are dying. Important food fisheries, once abundant, are undergoing a century-long decline in numbers, while soil erosion from the bay's surrounding farms, cities and suburbs is at record levels. Our poor record of stewardship is based on multiple-use resource policies that exploit rather than restore the valuable amenities of the coastal zone. The acceleration of the bay's decline in just the last thirty years is due to several remediable factors that amount to a monumental failure of modern conservation effectively to pursue ecological values.

Lester Brown, in discussing globally sustainable strategies, has called estuaries, and the Chesapeake Bay particularly, "protein factories" because of the valuable fish these inland seas harbor and nurse. "Estuaries play a role in the earth's aquatic food system," he notes, "that is far out of proportion to their size." Recently, James Lovelock and Lyn Margulis, in proposing the Gaia hypothesis of the earth as a self-regulating and reproducing supra-organism, suggested that estuaries and their surrounding wetlands are significant habitats for maintaining an equilibrium in the biosphere. "If we are lucky," writes Lovelock, "we may find that the vital organs in the body of Gaia are not on the land surfaces but in the estuaries, wetlands, and muds on the continental shelves."

To confront the eutrophication of the Chesapeake Bay, we must revise our outdated land-use, water contamination, tax, and funding legislation better to recognize the international needs for cheap protein sources in a starving world. The opportunity for change may exist if we can forge national and international constituencies that equitably reflect global, ecological realities. These proponents could then lend the political support necessary to create a renewable resource fund for safeguarding the rich tidal marshes and submerged grasses that form the productive nexus of bays and river mouths.

Sources for Further reading:

Brown, Lester, State of the World: 1985, (New York, Worldwatch Institute, 1985).

Caldwell, Lynton, Science and the National Environmental Policy Act. (Montgomery: University of Alabama Press, 1982).

Capper, Powers, and Shivers, Chesapeake Waters: Pollution, Public Health, and Public Opinion, 1607-1972. (Centreville, MD: Tidewater Publishers, 1985).

Kaper, J.B., et al. "Distribution of Vibrio parahaemolyticus in the Chesapeake Bay During the Summer Season," Estuaries, 4:4 (December, 1981), pp. 321-327.

Krupnick, Alan J., "The Chesapeake Bay Cleanup," Resources, #79 (Winter, 1985), Washington D.C.: Resources for the Future, pp. 1-5.

Lovelock, James, Gaia: A New Look at Life on Earth, (New York: Oxford University Press, 1979).

Roberts Jr., Morris, "Kepone Distribution in selected tissues of Blue Crabs, Callinectes sapidus, collected from the James River and the Lower Chesapeake Bay," Estuaries, 4:4 (December, 1981), pp. 313-320.

Siry, Joseph, Marshes of the Ocean Shore, (College Station: Texas A & M University Press, 1984).

Tippie, Virginia K., "An Environmental Characterization of the Chesapeake Bay," in The Estaury as a Filter, ed. by Victor Kennedy (Orlando: Academic Press, 1984).

United States Environmental Protection Agency, Chesapeake Bay: EPA Research Summary, (Washington, D.C., Government Printing Office, 1980).

United States Environmental Protection Agency, Chesapeake Bay Program Technical Studies: A Synthesis, (Washington, D.C.: Government Printing Office, 1982).

University of Maryland Water Resources Research Center, Annual reports: #16, 1973; #40, 1977; #96, 1976.

Session II - Effectively Educating the Public About Coastal Wildlife Conservation

II. P-4. Of Tinkers, Turrs, and Treaties: An Effective Wildlife Education Program for Reducing the Illegal Seabird Harvest on the North Shore of the Gulf of St. Lawrence, by Kathleen Blanchard.

The researcher found that approximately 98,000 seabirds are harvested annually from the remote lower North Shore of Quebec. Local attitudes about wildlife are utilitarian; 94 per cent of heads of households believe that illegally hunting seabirds for food is justified. Common misconceptions about wildlife are a target of long-term conservation education programs funded by World Wildlife Fund and the Canadian government. The presentation emphasizes the importance of conservation education in addressing wildlife management problems.

II. P-5. Chesapeake Bay Field Studies: A Window for Understanding the World Around Us, by William S. Portlock.

Field studies involving science students can help make a subject "come alive." The Chesapeake Bay Foundation sponsors and conducts on-water field studies in Virginia and Maryland. In 1981, I was asked to develop and operate the Virginia Education program for the Chesapeake Bay Foundation. I began with nine canoes, a few nets, some basic water quality testing equipment, and much enthusiasm. In this paper I will share information about the education program and will discuss some of the overall objectives and the specific equipment and techniques used in these field studies.

The Chesapeake Bay and its tributaries were the sites for our field studies. Since the students (and teachers) came from schools within the Bay's watershed, they could relate their day's findings to their "home" environment--an effective way to teach ecological principles. In addition, in 1983 the Environmental Protection Agency's Chesapeake Bay Study documented the Bay's decline and made gathering water quality and biological data more pertinent, while focusing students on an opportunity to contribute to a wetlands data base.[1]

The overall objectives of this program were: to increase students' and teachers' knowledge and understanding of the biological, chemical, geological, and ecological principles of an estuarine ecosystem; to improve students' process skills in the collection, recording and understanding of data; and to help students understand how scientific data, human needs, and personal values interact in making resources management decisions.

Orientation

Each group gathers together at the beginning of the field study day for a brief orientation to the day's activities, an explanation of safety rules, and discussion of the importance of cooperation in the field. We use an Earth Resource Technology Satellite (ERTS) image to identify the Chesapeake Bay and its tributaries, to locate where we are and where the students go to school, and to introduce terms (e.g., watershed, estuary, etc.) to be used during the day. We also show students a nautical chart and a topographic map for additional orientation. Later in the day, we refer back to the topographic map or nautical chart to triangulate our location.

Water Safety Instruction

Students are "introduced" to their vessels, nine 17-foot Grumman canoes, with a short discussion on boating safety and canoeing techniques. All participants select paddles and life jackets and practice basic canoe maneuvers on land. We then spend about 30 minutes launching, turning and steering in a straight line. We often take extra time traveling to our first site of investigation, so that students can become comfortable with their newly-learned canoeing skills.

Data Collection

When practical, we select three or four stations for testing and collecting data. These sites often include a mid-river station, a tidal marsh (fresh, brackish or salt water) and a shore site (or two) with contrasting sediments. We conduct physical and chemical tests and make biological and geological collections or observations.

At the mid-river or channel station, students use a lead line and fathometer to collect information about the bottom profile. A student-run transect through a meander leads into a discussion of water movement and sedimentation patterns. Then students measure turbidity with a secchi disc.

Turbidity affects the photic zone, and thus limits photosynthesis by the Bay's submerged aquatic vegetation, decreasing a valuable habitat. Students learn of the effects of upstream land alteration and erosion on waters downstream, and begin to realize the interrelated nature of the ecosystem.

Next, the students measure the water temperature and perform titration tests to measure salinity and dissolved oxygen from both surface and bottom waters. Detecting a "salt wedge" confirms their hypothesis that salt water is heavier than fresh and leads into a discussion on estuarine circulation.

Since dissolved oxygen is an essential component for life to exist in the aquatic environment, students sample the measure dissolved oxygen content from several locations. The concept (a very real problem in the Bay) of anoxic bottom water and eutrophication is introduced by comparing the student's measurements of surface and bottom waters. Students also analyze water samples for chlorine, nitrate and phosphate content.

Exploring and searching for life in the estuary are perhaps the most captivating activities for students. Life science and biology classes spend time in the marsh collecting, examining, and identifying specimens. Estuaries lend themselves well to these activities, because they are among the most productive areas in the world. Combining chemical and physical measurements with biological collections or observations of wetlands plants and animals in a close-to-home environment allows an ecological consciousness to develop in participants.

Occasionally, diseased fish showing hemorrhaging, lesions, or tumors come up in our nets. Scientists working at the Virginia Institute of Marine Science and the U.S. Fish and Wildlife Service are interested in these specimens to aid their work in identifying possible environmental contamination sites as well as for studying cancer-causing pathogens. High incidences of deformed or diseased aquatic life are being used to locate toxic "hot spots" in several locations within the Bay, and tissue analysis can sometimes help to identify the source of the contamination.

On a brighter note, occasionally rare or unusual sightings of animals can aid scientific knowledge. The ranges of some rare or endangered species may be contracting or expanding, and information from sightings or collections can help "fill in the gaps" of population dynamics. The catch and release of four striped bass, or rockfish, in the St. Mary's River in Maryland helped block construction of a dam which would have excluded all anadromous fish from ever again using the tidal fresh water section of the river for spawning.

The first nesting evidence of the American Oystercatcher on the western shore of the Chesapeake was discovered on a field trip. The recent "explosion" of the endangered Brown Pelican population into Bay waters has been documented by students and instructors on several field trips.

Wrap-Up

At the conclusion of each trip, we secure gear and gather for a "log-session." Students complete data sheets with the instructor who "logs" each measurement or identified specimen. The value of this exercise is great: data are examined and interpreted; students hear peers offer explanations and a synthesis of data and meaning evolves. The concepts of change, equilibrium and time/space incorporated in the day's activities are more clearly understood. Students are encouraged to "think globally, act locally."

In conclusion, these field studies offer students hands-on, feet-wet experience in observing, collecting, measuring, recording, and interpreting data. With such experiences, some teachers have been able to return to the classroom and draw on the experience throughout the year while others use the field trip as a culminating activity.

With improved science education a priority of the educational system today, perhaps we will see field studies incorporated on a greater scale in the future.

NOTES

[1] Juvenile fish surveys, wetlands inventories, and migratory and breeding bird census data have been used by the Virginia Marine Resource Commission, U.S. Fish and Wildlife Service and American Birds (Vols. 31-35).

Session III - Atlantic Estuaries: Promoting the Values of Coastal Wetlands to Educators and the Community.

II. P-6. The Tinicum National Environmental Center, by Gregory A. Breese.

The Tinicum National Environmental Center (NEC) is administered by the United States Fish and Wildlife Service as a unit of the National Wildlife Refuge System, located in Philadelphia, Pennsylvania. The center (about 900 acres in size) consists of tidal freshwater marsh, impoundments, fields, and woods. The tidal freshwater marsh is the largest remaining in Pennsylvania and contains a wide variety of plants, most notably wild rice. Total land water acquisition will approximate 1,200 acres.

Through the efforts of local citizens, Congress gave the U.S. Fish and Wildlife Service administrative responsibility for the center in 1972 and designated three main objectives:

1) to protect the tidal freshwater marsh and its wildlife

2) to provide an area for environmental education and

3) to provide an area for outdoor recreation, as long as this doesn't interfere with the first 2 objectives.

In order to accomplish the environmental education (EE) objective, with very limited manpower, our policy is to provide teacher workshops only. In the long run, this will allow us to reach more students through the "trickle-down" effect.

In 1978, the Tinicum NEC staff met with local teachers and administrators to explain the EE program. Although many were interested, requests for the attendance at workshops were disappointing. A proposal to include our EE workshop in the states in-service teacher education program was submitted to and approved by the Pennsylvania Department of Education. This allowed us to offer one graduate-level credit toward the teachers' continuing education requirement (teachers must earn 24 credits during their first six years in order to become permanently certified). Coordinating with the schools in this way has benefited both the teachers and Tinicum NEC. The teachers get assurance that our course meets state standards and can work towards their permanent status through our course. We get free, effective advertising and a very tempting "carrot" to offer. The only drawback to this arrangement is that a number of teachers take the course as a quick, easy way to gain a credit and have no intention of implementing the information in their classwork (although it can be argued that these are the very people who need to be exposed to our message the most).

Tinicum NEC offers two EE Workshops (each gives a teacher one graduate credit): "Tinicum Marsh: An Introduction to Environmental Education," and "Tinicum Marsh: Further Studies." The introductory course has been offered since 1978 and consists of three, five-hour sessions, for a total of 15 hours. Topics of the course include lectures on ecology and wildlife management, a slide show on Tinicum NEC's wildlife, the movies "Cry of the Marsh" and "America's Wetlands," "hands-on" activities from OBIS and the USFWS, and a 3 1/2-mile wildlife observation walk. The purpose of this course is to familiarize the teachers with what Tinicum NEC has to offer, give teachers basic understanding of ecology and wildlife management, and let the teachers experience various EE activities so they will know what to expect when they return with their students. It is hoped that this course provides teachers enough background information so they can make their lesson plans and use EE in their classes. At the end of each workshop, teachers fill out an evaluation. All evaluations, so far, have indicated that teachers are pleased with the course content and feel it meets our stated objectives.

One consistent comment we received on the evaluations was for another course that would devote more time to plant and animal identification. In 1983 Tinicum NEC began offering a "further studies" course, designed to supplement the original introductory course. This 15-hour course (open to teachers who have completed the introductory course or an equivalent course) focuses on three major subjects: Ornithology, Botany, and Tidal Freshwater Marsh Ecology. The teachers get a chance to bird, botanize, walk through a marsh, use fieldguides, and try EE activities emphasizing these subjects. The course has been enthusiastically received, despite the knee-deep marsh muck.

Just because teachers enjoy a course (more teachers register than can be accommodated) does not necessarily mean that our EE program is doing what we intended. Two basic questions need to be addressed:

1) Are teachers better able to utilize our Center?

2) Do they incorporate EE into their courses?

In 1981, a questionnaire was sent to 58 teachers who attended the 1980 introductory courses. Twenty-five teachers returned the questionnaire. Of these 25 respondents, 18 said that they used the information in their classed, both outdoors and indoors. Only 2 teachers had made field trips to Tinicum NEC, however.

A more subjective way of judging the effectiveness of our program is by observing classes on field trips to the center and determining which teachers are "graduates" of our courses.

Based on our observations, about 1/5 of the classes are led by our "graduates." These classes are generally well-behaved and the students usually have specific activities to keep them busy. The remaining classes are either led by specialists from the Academy of Natural Sciences, or are led by teachers who apparently have no plan other than to let the students take a walk and see the center. Unfortunately, classes in the latter category, all to often, deteriorate into a race to the Visitor Center for a drink of water.

From these observations, it seems that Tinicum NEC's EE program is successful, in that teachers who attend our workshops are able to use the information in the classroom and on field trips and, when they bring their classes to Tinicum NEC, the students have specific activities that seem to give them a better understanding of their environment. However, there doesn't seem to be a significant increase in the number of classes coming to the center and the increase in the percentage of these classes being led by our "graduates" has not been impressive.

II. P-7. The Hackensack Meadowlands Environment Center--An Introduction, by Anne Galli.

The Hackensack Meadowlands Environment Center is one of the newest facilities in New Jersey, and it has the most unlikely location for an education center. The potential for the Center is unlimited, mainly due to its unusual location and the combination of natural and man-made facilities available.

The Hackensack Meadowlands Environment Center is located in the New York metropolitan region, situated in Lyndhurst, Bergen County, New Jersey. The Center is in the shadow of the New York skyline in the midst of the Hackensack Meadowlands, bounded on the east by the New Jersey Turnpike, on the north by the New Jersey Sports Complex, (Giants Stadium, Meadowlands Racetrack, and Brendan Byrne arena), on the south by the Sawmill Creek Wildlife Management area, and on the west the "Garbage Range," man-made mountains of garbage covering 600 acres rising 150 feet.

The Environment Center is a modern structure on pilings over the Kingsland Lagoon. The building and its grounds represent the first stage in the reclamation of almost 2000 acres of former landfill designated to become a park.

The operation of the Environment Center is unusual. The building was funded by money from the New Jersey Sports and Exposition Authority and the State Green Acres Program. The Center is administered by the Hackensack Meadowlands Development Center, an independent agency established by law to regulate land use and planning in the Hackensack Meadowlands

District. The ongoing funding for the Environment Center is provided by the Sports Authority as part of a mitigation agreement that enabled construction of the Sports Complex.

The modern two-story building consists of 25,000 sq. ft. of space, most available for public use. It has a large auditorium seating 288. In 1986, an 8000 sq. ft. museum is scheduled for completion. The museum will feature "hands-on" exhibits on natural resources, recycling, salt and freshwater ecology, live native animals, a river maze simulating the journey of fish through the Hackensack River estuary, a history time line focusing on man's use of the Meadowlands, and a planetarium, an important feature in an urban environment with so much light pollution that the night sky is obscured and the stars not visible.

The building has two classrooms, staff offices, a library, kitchen, lecture hall, and laboratory. The Center's showpiece is the octagonal 2,700 sq. ft. Visitors' Center, where visitors and students have a panorama of the natural as well as the dramatic man-made environment. From the Visitors' Center vantage point, one may gaze at the mudflats of a wildlife refuge restoring itself from a phragmites-dominated impoundment to a classic cordgrass saltmarsh. You can watch migrating shorebirds, ducks, and geese as they fly from the marsh framed against the New York skyline, but you cannot escape the evidence of man's impact on the environment. The view includes bumper-to-bumper traffic on the New Jersey Turnpike, lines of garbage trucks entering the landfill, and the sound of jets descending on Newark Airport. The Environment Center is joined literally to its sister organization, the Hackensack Meadowlands Development Commission by a skywalk above the edge of the impoundment. This link is not merely symbolic. The Hackensack Meadowlands Development Commission provides technical expertise and administrative services for the Environment Center.

Programs are developed and implemented by the Environment Center staff. Three program specialists and two support staff coordinate all activities. Technical expertise and information is available from HMDC divisions of engineering, environmental operations and solid waste management.

In the short period since its inception in 1982, the Environment Center has gained widespread recognition for school programs. The programming deals with the traditional ecological studies of habitats, such as a recovering marsh ecosystem. More importantly, it focuses on everyday critical environmental issues. These issues are wastewater treatment and sewage, land use planning, natural resources, recycling, and solid waste management. A unique feature of the Environment Center is its proximity to an operating sewage treatment plant, garbage baler and operating sanitary landfill--all within walking distance. How better for student or adult to come to understand the crisis we now face in garbage disposal then to experience the sight, sound, and smell of a landfill as they wait in line with the garbage trucks which share a joint site entrance with the Environment Center? Or perhaps, a visit to the HMDC baler, where each bale of garbage weighs 3000 pounds and the machines work 24 hours a day to keep up with the flow.

Since the doors opened, more than 10,000 students a year visit the Center. The popularity of the programming requires more expansion of the staff. The majority of the students are in the elementary level.

VISITOR SUMMARY
HACKENSACK MEADOWLANDS ENVIRONMENT CENTER
FOR THE YEAR 1984

	NUMBER OF GROUPS	NUMBER OF PARTICIPANTS
Colleges	13.03%	6.04%
High School	5.88%	5.22%
Elementary Schools	33.61%	30.64%
Scout Groups	14.71%	5.01%
Camps	2.10%	1.93%
Community Groups	16.82%	11.06%
Special Events & Other	13.87%	40.10%

PERCENTAGE BREAKDOWN IN/OUT OF DISTRICT

Total Number of Groups	235	
Groups in District	77	32.77%
Groups out of District	158	67.23%

Programs for the general public include both educational and recreational opportunities. Annually the Environment Center offers guided canoe trips, an Environment Fair, River Festival, Wildlife Art and Carving Show, bird-watching events, planetarium shows, volunteer day, and workshops on a variety of topics.

Another facet of education is the internship program which is offered for college students. This program covers work-study experience in air and water quality monitoring, land use planning, environmental education, and parks and recreation planning. Student participation is nationwide. Projects are designed for the individual's career development.

The Hackensack Meadowlands Environment Center also contains a modern state-certified environmental laboratory which is a research, monitoring, and educational resource for the region's schools and colleges. Ongoing surface water monitoring and analysis provide information on area water quality. Analysis of marsh soil for heavy metals concentrations details the extent of past industrial pollution. Analysis of tissue from marsh animals helps assess the biological health of the estuary.

Air quality monitoring at the Sports Complex has been performed by the laboratory since 1979. Groundwater monitoring at sites around the state's largest landfills measures the impact of possible leachate contamination and guards against pollutant migration.

During the next three years, the lab will be working to determine what steps must be taken to build a park on closed landfill. The laboratory provides opportunities for student internship and graduate research.

The moods and faces of the urban wetlands of the Hackensack Meadowlands District are many. The educational opportunities and combination of physical resources available for public education and awareness are unique in many ways. The Center looks forward to growth in meeting the public's demands for service.

II. P-8. Decision-Making/The Chesapeake Bay: An Environmental Education Simulation, by Emmett L. Wright and Gary Heath.

The presentation will outline the role of gaming/simulation strategies in teaching decision-making about complex environmental issues and the steps one needs to go through to successfully develop and implement a multi-disciplinary environmental education program of study. The Decison-Making/The Cheaspeake Bay curriculum will be discussed as an example of a multi-disciplinary curriculum that addresses the processes involved in developing sound public for specific environmental issues.

III. Presentations:
Environmental/Education Philosophy

III. A. Environmental and Cultural Education--Teaching Care for the Earth © 1985. Michael J. Caduto, Consultant, Norwich, Vermont.

Education springs forth from life. It is a pursuit of values and moral issues, as well as knowledge. We do not experience the world with our minds alone; our emotions and actions are vital parts of our total being. Moral education addresses our thoughts, feelings, and conduct toward ourselves, other people, and the environment.

> We are one in relationship with the earth and other people, doing good supports this relationship. Love and moral goodness are inseparable, they are the elemental components of a life ethic.[1]

Environmental education, if it is to grow and endure, needs to include moral education as well as the social and cultural aspects of the "wholistic" world that it seeks to nurture. If there is truly a oneness between a cottony milkweed seed blowing over a late summer field in Pennsylvania and the saguaro fruit eaten by Papago Indians in the Sonoran Desert of Arizona, between the busy sounds of Toronto on a bustling afternoon and the muted cries of a hungry child in the slums of Calcutta, then somehow our teaching must reflect this trans-global unity.

Just as environmental educators have stressed that damage done in one place affects the earth's ever-widening circles of life, so too does healing spread like the roots and branches from a sprouting seed. Our behavior toward the environment reflects the way we act in social and political settings.

> There is an uncanny resemblance between our behavior toward each other and our behavior toward the earth. By some connection we do not recognize, the willingness to exploit one becomes the willingness to exploit the other....It is impossible to care for each other more or differently than we care for the earth.[2]

The struggle against destructive and repressive forces walks in tandem with our efforts to foster healing and caring ways of living with society and the environment.

The importance of approaching values and moral issues in environmental education has been recognized throughout the world. Participants at the 1977 Intergovernmental Conference in Environmental Education in Tbilisi, Union of Soviet Socialist Republics, recognized that ethical values should be taken into consideration in developing environmental education programs, and that environmental education should be aimed at creating an awareness and values directed toward improving the qualities of life.[3] Environmental education programs in many countries include values and moral issues in the environmental education curriculum: Guatemala,[4] The Nordic countries,[5] Kenya,[6] Korea,[7] Czechoslovakia,[8] The Federal Republic of Germany,[9] England,[10,11] Sweden,[12] Union of Soviet Socialist Republics,[13] China,[14] Dominican Republic,[15] Brazil,[16] Australia,[17,18] in a cooperative effort of the European Community,[19] and in the United States.[20,21,22]

How and why do people make their decisions? What are the attitudes and values that their conduct is based on? A brief look at the theories of moral development help us to understand how values form and change.

Volumes have been written analyzing the psychoanalytical theories of Sigmund Freud[23,24,25] and Erik Erikson,[26,27] as well as the social learning theory which holds that values are formed through positive and negative reinforcement of behavior.[28,29]

The moral development theories of Jean Piaget[30] and Lawrence Kohlberg[31,32] have become the basis for many modern values education programs. Piaget and Kohlberg propose that moral development occurs in distinct stages that are a natural, hierarchical progression during a child's growth. Younger children are morally dependent upon the rules of authority figures, while older children and adults become morally autonomous beings whose conduct is guided by personal moral standards. A lively debate continues over the research methods used by Piaget and Kohlberg, the composition of their audiences, and the strong male bias inherent in their theories, which view female behavior as a deviation from the male-oriented norms.[33] Studies show that males favor the separateness of the individual self over connection to others and lean more toward an autonomous life of work than toward the interdependence of love and care.[34] Carol Gilligan points out that

> In the different voice of women lies the truth of an ethic of care, the tie between relationship and responsibility and the origin of aggression in the failure of connection. women's development delineates the path not only to a less violent life, but to a maturity realized through interdependence and taking care.[35]

In women's development there is a fusion of justice and love--the kind of concepts and conduct that environmental educators try to teach--a sense of being a part of the environment, wholism, and interdependence.[36]

Environmental education programs also need to consider spiritual and religious values. Environmental values should be an important part of theology and religious teaching.[37,38] Richard Baer puts it well: "Until we recognize that man's spirit itself is the ultimate frontline of the environmental crisis, we will continue to nibble away at the edges.[39]"

In *Bringing Up a Moral Child*, Michael Schulman and Eva Mekler propose three important foundations for teaching positive moral intentions and a sense of being fair and just:[40]

> *Internalization* occurs when a child has developed an inner voice that guides her or his actions and is based on standards of "right" and "wrong" as learned from parents, teachers, and other adults. This inner voice guides the child away from selfish and aggressive tendencies and provides self-control *before* an action is taken.
>
> *Empathy* provides a valuable sense of being connected with our environment. If we feel what another person feels, or can project an emotional feeling into a tree or animal (sad, glad, hurt, happy), we want to help because we share that pain, joy, or other emotion.
>
> *Personal Moral Standards* allow a child or adult to function as a morally autonomous person living according to standards that are held true no matter who agrees or disagrees with them. They are more effective if applied in a democratic teaching situation.

In several earlier articles[41,42,43] and a forthcoming book,[44] I have proposed a wholistic approach to teaching environmental ethics. This plan is structured around the general concept of moral development and the moral education strategies of values analysis, values clarification, action learning, confluent education, inculcation, and behavior modification. Each of these values education methods needs to be carefully considered in light of the teacher's skills and background, the needs of the audience, and the learning situation at hand. Space limitations prevent a detailed discussion of this program here.

With continued work in developing and using methods for teaching environmental ethics, the environmental and cultural links described at the beginning of this article have proven to be fertile ground.[45] In particular, the study of American Indian cultures and their beliefs, as revealed through their lives and stories, offers great promise.

At first this idea may seem worn, for Indian study is and has been part of many environmental education programs dating back to the founding of the Boy Scouts and Girl Scouts in the early 1900s. Here I propose a perspective of realism that moves beyond our romanticizing of the American Indian. The circles of giving and receiving that form the basis for the Indians' relationships with each other and the earth can be applied to today's environmental and social realities. This teaching occurs, as Paulo Freire puts it, in a dialogue between teacher and learner that fosters love, hope, and critical thinking.[44]

There is a movement afoot. It grows from the need to heal our relationship with the people who first greeted European immigrants to this country. The past three centuries have left deep wounds because of our historical and contemporary oppression of the Indians and environment in America. Native peoples' healing ways are a paradigm for the answers to our own search for reconciling our driven Western lifestyles with our intent to live whole, healing lives, both for ourselves and as an example for others.

Our need for growth encompasses not only the spheres of science and intellect but the cultural and spiritual realms as well; to seek the "is"-ness of existence in time unpassing. From the seeming ambivalence of intuition and feeling come our greatest insights. Conscious thought can guide our dreams, but it cannot create them. With the greatness of our understanding of the oneness we share with the earth and all people, a sense of humility replaces the hubris of the past. On the infinite plain of life our human thoughts and deeds are small--a mere dimple on a sand grain scoured and bleached at sea's edge. When a tiny seed riding on the wind appears as a planet, an entire world, then we will be reaching toward the connected center of all life.

BIRDFOOT'S GRAMPA

The old man
must have stopped our car
two dozen times to climb out
and gather into his hands
the small toads blinded
by our lights and leaping,
live drops of rain.

The rain was falling,
a mist about his white hair
and I kept saying
you can't save them all,
accept it, get back in
we've got places to go.

But, leathery hands full
of wet brown life,
knee deep in the summer
roadside grass,
he just smiled and said
they have places to go to
too.[47]

REFERENCES

[1] Michael J. Caduto, Teaching Environmental Ethics: A Wholistic Program in Environmental Values Education (Paris, France: United Nations Educational, Scientific, and Cultural Organization [Unesco], 1985), p. 60. Final draft prior to publication.

[2] Wendell Berry, The Unsettling of America: Culture and Agriculture (New York: Avon Books, 1977), pp. 123-124.

[3] Unesco, Intergovernmental Conference on Environmental Education, Tbilisi, U.S.S.R.: A Draft Final Report (Paris, France: Unesco, 1977), pp. 1-69.

[4] Dr. Luis F. Capurro, A Case Study of Environmental Education in the Occidental Highlands of Guatemala, in Margaret E. Cowan and William B. Stapp, Environmental Education in Action - V: International Case Studies in Environmental Education (Columbus, Ohio: ERIC Clearinghouse for Science, Mathematics, and Environmental Education: Ohio State University, 1982), pp. 226-229.

[5] Nordic Cultural Cooperation, The Teaching of Environmental Education in Nordic Compulsory Schools (Copenhagen, Denmark: The Secretariat for Nordic Cultural Cooperation, 1977), pp. 1-22.

[6] Dr. Irma A. Allen, Environmental Education for Nomads: A Test Case in Kenya, in Cowan and Stapp, pp. 240-248.

[7] Dong Jun Kim, Educational Development on Environmental Ecology for Schools and Voluntary Associations in Korea, in Cowan and Stapp, pp. 63-66.

[8] Environmental Council of the Government of the Czech Socialist Republic, *Environmental Education: Guidelines in Methodology for Teachers of General Subjects at Elementary and Secondary Schools in the Czechoslovak Socialist Republic* (Prague, Czechoslovakia: Research Institute of Building and Architecture, 1975), pp. 1-101.

[9] Federal Ministry of the Interior, *Report of the Federal Republic of Germany on the Human Environment*, 1972, pp. 1-160.

[10] Carson, Sean, *Teachers for Environmental Education* (England: County Advisor for Environmental Education, The Royal Society for the Arts, 1978), pp. 1-10.

[11] National Association for Environmental Education, *A Statement of Aims* (Birmingham, England: NAEE, 1976), pp. 1-11.

[12] Anne Von Hofsten, Environmental Education in Sweden: A Project on Natural and Technical Science, in Cowan and Stapp, pp. 140-145.

[13] Innokenti Laptev, Environmental Education in the U.S.S.R., in Cowan and Stapp, pp. 37-44.

[14] Wang Huen-Pu, General Review of Environmental Education in China, in Cowan and Stapp, pp. 50-57.

[15] Sophie Jakowska, Environmental Education in the Dominican Republic, in Cowan and Stapp, pp. 50-57.

[16] Myriam Krasilchik, A Project of Environmental Education in Brazil, in Cowan and Stapp, pp. 192-196.

[17] Peter J. Fensham and Stewart G. Jackel, Garden Settings for Environmental Education: Case Study Two, in Cowan and Stapp, pp. 251-253.

[18] Ian M. Robottom, Environmental Education at Deakin University Australia: An Issue-based Approach, in Cowan and Stapp, pp 275-286.

[19] Anton Trent, The European Community Environmental Network, in Cowan and Stapp, pp. 77-86.

[20] Clifford E. Knapp and Joel Goodman, *Humanizing Environmental Education: A Guide to Leading Nature and Human Nature Activities* (Martinsville, Indiana: American Camping Association, 1981).

[21] William B. Stapp and Dorothy A. Cox, *Environmental Education Activities Manual* (Dexter, Michigan: Thomson-Shore, Inc., 1979).

[22] Steve Van Matre, *Sunship Earth* (Martinsville, Indiana: American Camping Association, 1979).

[23] Ursula Frischnecht and Kurt Frischnecht, Values Education and the Environment, (Ann Arbor, Michigan: University of Michigan School of Natural Resources, 1980), p.1., Unpublished Research Report.

[24] Karl E. Scheibe, *Beliefs and Values* (New York: Holt, Rinehart, and Winston, Inc., 1970), p. 95.

[25] Michael Silver, *Values Education* (Washington, D.C.: National Education Association, 1976), p. 19.

[26] Frischnecht, p. 2.

[27] Erik H. Erikson, *Childhood and Society* (New York: W. W. Norton and Co., Inc., 1950), pp. 247-274.

[28] Frischnecht, p. 2.

[29] Silver, p. 20.

[30] Jean Piaget, *The Moral Judgment of the Child* (New York: Harcourt, Brace, and Co., 1932), pp. 1-103.

[31] Lawrence Kohlberg, The Child as Moral Philosopher, in Barry Chazan and Jonas F. Soltis (eds.), *Moral Education* (New York: Columbia University Press, 1973).

[32] Lawrence Kohlberg, *The Philosophy of Moral Development: Moral Stages and the Idea of Justice* (volume 1) (San Francisco, California: Harper and Row Publishers, 1981), p. 47.

[33] Carol Gilligan, *In a Different Voice* (Cambridge, Massachusetts: Harvard University Press, 1982), p. 14.

[34] Ibid., p. 17.

[35] Ibid., p. 172-173.

[36] Caduto, p. 22.

[37] Frederick Elder, *Crisis in Eden* (New York: Abingdon Press, 1979), p. 141.

[38] Charles H. Yaple, The Christian Church and Environmental Education: A Study of Involvement in the United States (Syracuse, New York: State University of New York, College of Environmental Science and Forestry, 1982), p. 3. PhD dissertation.

[39] Richard Baer, Jr., Religion and Environment, (Syracuse, New York: Paper presented at the 21st National Conservation Education Association Conference, August 11-14, 1974), in Yaple, p. 41.

[40] Michael Schulman and Eva Mekler, *Bringing Up a Moral Child: A New Approach for Teaching Your Child to be Kind, Just, and Responsible* (Reading, Massachusetts: Addison-Wesley Publishing Co., Inc., 1985).

[41] Michael J. Caduto, A Review of Environmental Values Education, *Jour. Environmental Education*, 14(3): 13-21 (Spring) 1983.

[42] Michael J. Caduto, Toward A Comprehensive Approach for Environmental Values Education, *Jour. Environmental Education*, 14(4): 12-18 (Summer) 1983.

[43] Michael J. Caduto, A Teacher Training Model and Educational Guidelines for Environmental Values Education, *Jour. Environmental Education*, 16(2): 30-34 (Winter) 1984/85.

[44] Michael J. Caduto, *Teaching Environmental Ethics: A Wholistic Program in Environmental Values Education* (Paris, France: Unesco, 1985), Final draft prior to publication.

[45] Michael J. Caduto, Nature in Native American Myths: A Program in Environmental Ethics, *Nature Study: A Journal of Environmental Education and Interpretation*, 38(1): 3-5 (September) 1984.

[46] Paulo Freire, *Pedagogy of the Oppressed* (New York: The Seabury Press, 1974), p. 80-81.

[47] Joseph Bruchac, *Entering Onondaga* (Austin, Texas: Gold Mountain Press, 1978), p. 47.

III. B. Foundation for the Future: Ecological Awareness

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A sustainable socio-economic system must be built on a foundation of public awareness of four fundamental principles of ecology: all things are interrelated, everything requires energy, everything goes somewhere, and there are limits to growth. Examples of how these principles relate to all ecosystems and current environmental problems were presented.

III. C. Perspectives of Society and Education that Influence Environmental Problems

Liza Garmulewicz, University of New Brunswick.

Although issues of environmental degradation have been recognized and confronted for a number of decades, it is important to realize that as technological society advances, environmental problems continue to flourish. One way of gaining a better perspective on this detrimental trend is to consider the complexity of the environment and its interrelatedness with two other facets of society--societal ideologies and education.

The educational system is interwoven with environmental problems and societal ideologies, being influenced by, as well as influencing, the society of which it is a part. The controlling attitudes and values of society, accepted as the dominant social ideology, influence the context within which problems are perceived as well as the approach taken to resolutions (Capra, 1983; Cotgrove, 1982).

Previous attempts to solve environmental problems have recognized the importance of one or the other of these two components (Commoner, 1974; New Brunswick Department of Education, 1975; Ontario Ministry of the Environment, 1983). Many efforts looked to the educational system for change, encouraging the introduction of environmental programs into the junior and senior high schools (New Brunswick Department of Education, 1975). In an attempt to influence societal ideologies, dominant attitudes and values have been challenged in the political arena. Since these alternative approaches focus on narrow solutions, neither has been very effective to any great extent (Sale and Lee, 1972; Commoner, 1974). The links between education and societal ideologies need to be recognized so that problems inherent in each can be identified and dealt with, thereby enabling environmental problems to be approached from a new perspective.

The Educational System

Although the educational system presents an avenue of hope for coming to terms with society's environmental problems, Goodlad (1984), Karp (1985), and Sizer (1984) have called the effectiveness of the public school system into question. In his book, A Place Called School, Goodlad identifies two major deficiencies in the school curriculum that warrant serious consideration. These are: a failure to differentiate the relationship between facts and concepts; and general failure to view subject matter as an area in which to experience the struggles and satisfactions of personal development. Such problems relate directly to school structure and poor teaching practices.

Goodlad (1984) and Sizer (1984) have shown that teaching inadequacies dominate the educational system. Although this finding is typical of most school subjects, teaching inadequacies are particularly obvious in the subjects of social studies and science (Goodlad, 1984). Since environmental problems have both a social and scientific dimension Goodlad's findings are particularly relevant to this thesis.

In support of his conclusion, Goodlad (1984) notes that social studies teachers list reasoning objectives such as deriving concepts, hypothesizing, exploring casual relationships, and drawing conclusions, as fundamental to their teaching. Their tests, however, predominantly require low-level intellectual skills such as recall of memorized information. Furthermore, the classroom observations of Goodlad's associates reveal that teachers commonly reduce intrinsically human topics to dates and places for memorization. Generally, very few activities require higher level skills such as problem-solving, planning a project, achieving group goals, or critical thinking. The result is that students enjoy social studies less than any other subject and perceive it to be one of the most difficult.

When one moves from social studies to examine the state of elementary science education, the picture is very similar. Once again teachers' stated expectations for students' learning do not correspond with their teaching practices. The lower intellectual skills continue to be emphasized. Goodlad (1984) found that science at the elementary level is ill-organized and repetitive. His study shows that at grade four there is a shift of focus from the child and his/her reciprocal relation to the natural world, to the teaching of science for its own sake. In summarizing his data, Goodlad (1984) states:

> Few of the activities are likely to promote an understanding of the basic interdependence of the biological and physical resources of the environment or

> the manner in which heritages and traditions of the past are operative today and influence the directions and values of society. Yet it is to goals such as these that such subjects supposedly are committed. (p. 236).

The need for relevant curriculum content is necessary not only in terms of professed intellectual goals, but also in making subjects more meaningful to the students and their personal development. Students reported that they liked working as a class or alone the least, but Goodlad (1984) found that these two styles of working are the most common. Sizer (1984) found that typical classroom practices force students to take passive rather than active roles for the majority of their education. Students are bored quite often, not being able to see the relevancy in what they are learning nor able to maintain interest throughout their lessons. Not even one percent of instructional time involves students in open responses, encouraging reasoning or student opinions (Goodlad, 1984). Goodlad concludes that subjects as both ends and means begin to dominate in the upper elementary grades while a student's personal development seems to get lost in the shuffle.

In responding to this demand to address student needs, many educators advocate the use of inquiry-based activities that promote student involvement by linking subject content to real-life examples. Although Goodlad (1984) and Sizer (1984) reported their pedagogical findings and recommendations in the 1980s, the need to involve students in real-life issues was recognized and given serious attention in the 60s and 70s. Numerous curriculum development efforts, including environmental projects, were introduced into the curriculum in response to both educational and societal needs. Although most environmental educators promoted outdoor and environmental education as a way of teaching, many environmental programs were added to the existing curricula as a unit of study in science or social studies, or as a separate course. Alternately, environmental programs often comprised only brief outdoor education experiences at designated centers with little, if any, classroom follow-up. As such, environmental education did not constitute an integral aspect of the curriculum and, as with other curriculum projects of the time, its impact was limited.

Time has shown that when programs are treated as an appendage to the central curriculum, they do not flourish. Although past environmental education programs incorporated suggestions for improved pedagogy, they lacked an integrative structure. This is supported by Goodlad (1984), who identifies the formal structure of the curriculum as a major factor that can limit the effectiveness of pedagogical modifications. For example, the structure of the school, in terms of teaching and learning through separate subjects, negates or hinders change. This compartmentalized structure seems to foster a short-term rather than long-term view, thereby stressing topics and facts rather than concepts and relationships. The Science Council of Canada (1984) notes this trend, emphasizing the need to create strong links among science, technology, and society--a link which is missing in the education curricula of the schools and is essential in today's world. Unfortunately, education has not responded to this need. The structure of the curriculum is so inhibiting that science and social issues are rarely integrated in the classroom (Goodlad, 1984). The effect is a limitation on the variety of viewpoints considered and the values being promoted.

This segmented approach to education and knowledge fosters very polarized perspectives. C.P. Snow refers to this polarization in The Two Cultures and The Scientific Revolution, (Snow, 1959). He sees literary intellectuals at one pole and scientists at the other being split by mutual incomprehension--sometimes hostility and dislike, but most of all by a lack of understanding. Snow referred to these separate views as two distinct cultures, each being impoverished by their polarization. As Goodlad (1984) and McInnis (1982) have noted, our educational system reflects this trend in society: polarizing students rather than giving them an integrated perspective. Without the links between science, technology, and society, students' ability to relate to the general curriculum will be hindered as subjects become increasingly artificial and cut off from human experience.

Societal Ideologies

The argument Goodlad (1984) and McInnis (1982) make about the negative effects of the segmented educational perspective is similar to the arguments of Bybee (1979b), Chen and Novik (1984), and Cotgrove (1982) in relation to society and environmental degradation.

Cotgrove's ideas are particularly relevant. He has identified four distinct ideologies by putting in opposition objectivity and subjectivity on a vertical axis and separation and integration on a horizontal axis. These ideologies are illustrated in Figure 1.

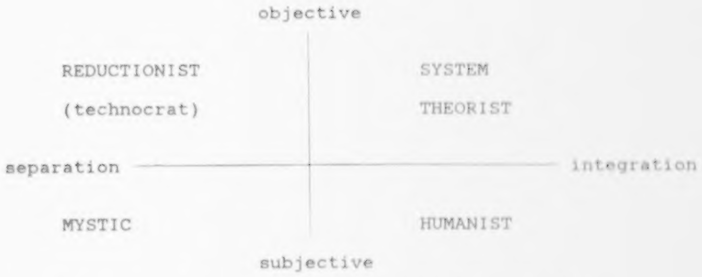

Figure 1: Polarized Ideologies (Cotgrove, 1982)

Cotgrove's stereotypical classification characterizes a person who thinks exclusively in terms of separation and objectivity as a reductionist thinker; one who is strictly objective but favors integration is a system theorist; a humanist is very subjective and prefers an integrative perspective; while a mystic is subjective and is preoccupied with self-analysis.

Each of these polarized ideologies look at problems from different perspectives. System theorists tend to look at a problem in its entirety. Since they are factually oriented, they pull information together in an objective sense, having difficulty incorporating subjective elements (Miller, 1984). In comparison, mystics are not bound by empirical observations. They look at the roots of a problem, arguing these must be dealt with before solutions are to be realized. Defining a third ideology, humanists, having a social perspective, stress non-material values and harmony with nature. The humanists see the earth's resources as limited and nature as delicately balanced. They insist that there are definite limits to science, and that there should be an integration of both thought and feeling.

As our technological society has developed, these three ideologies have been dominated by the technocratic ideology which helped foster and encourage many of the scientific and technological advancements (Cotgrove, 1982). In referring to this technocratic ideology as the controlling social paradigm, Cotgrove states,

> It is dominant not in the statistical sense of being held by most people, but in the statistical sense that it serves to legitimate and justify the institutions and practices of the market economy (p. 27).

Bybee (1979b) identifies some of the orientations integral to the industrial society paradigm as,

> ...a belief that progress is our most important product; the assumption that material affluence is synonymous with happiness; a faith in the capacity of science and technology to solve problems; an attitude of dominance over nature; and a view that natural resources are unlimited (p. 157).

These belief have dominated industrial/technological society and, due to their nature, have promoted not only scientific innovations but ecological degradation as well.

Holistic Perspective

In order to bring about the necessary change in society and education, the approach taken to solve complex science-related social issues must change.

In attempting to solve many contemporary problems, science and technology have been largely influenced by the reductionist approach to problem-solving (Bybee, 1979a). This approach may be very effective in solving some problems, but when it is applied to issues involving the biosphere and its inherent systems the interrelated aspects of the problems are ignored. Rather than do away with reductionist techniques, which are still of great benefit, these perceptions need to be balanced with a set of beliefs and values which are holistic--humanistic--environmental--natural (Bybee, 1979b).

The ability to recognize the various interacting parts of a system and develop an intuitive sense for the behavior of the whole system is essential. The need for this holistic perspective gives rise to a new paradigm, one that integrates the perspectives of the four polarized ideologies. Little (1976) has characterized people who hold such an ideology as those who have a high regard for both people and the non-human elements in nature. He has called these people 'generalists' and has noted that they express a marked interest in a variety of encounters with both people and objects, with no implication that such people have only superficial skills.

Being specialized in both domains, generalists can make valid and reasonably accurate interpretations in both subjective and objective contexts. They can utilize both personalistic and physicalistic modes of experiencing the environment when the situation calls for it. They will be able to make inferential leaps in person-perception studies, and check inferences against more solid data. Little's generalists can be characterized within the circle in Figure 2.

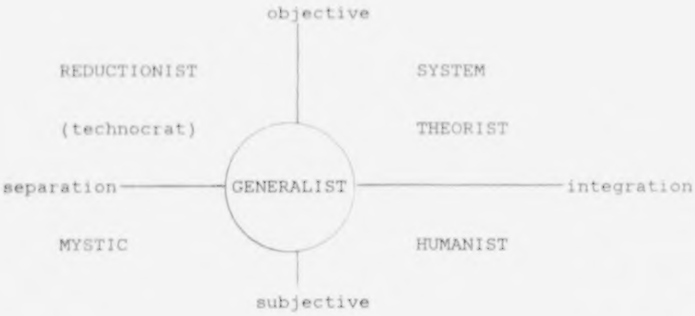

Figure 2: An Integrated Ideology

Bybee (1979b) contends that such a paradigm is evolving, and that it necessarily will be rooted in ecology. Such a foundation emphasizes the fact that people are biological, and as such they are dependent on their interactions with the rest of the biosphere for survival. Bybee sees this "Ecological Society" as being a more encompassing paradigm that uses technology of appropriate size, as a means of helping solve human problems, not as an end in itself. The fundamental concerns of this ecological society are the individual, the environment, and society. Growth will continue in such a society but it will be sustainable, not substantial (Bybee, 1979b).

This synthesis clearly represents an alternative perspective to help solve the world's critical environmental problems. Therefore, if we are finally to address these problems we must look to ways in which this generalist ideology can be incorporated into society. Since our educational system has a profound impact on society, and since people's attitudes and values begin developing in their early years, a logical starting point seems to be the elementary school.

Holistic Environmental Education

Given the need to teach in a holistic context, so that knowledge is integrated and a new paradigm based on ecological principles is encouraged, educators should look to a holistic approach to environmental education for positive curricular changes. Environmental education is integrative in nature and tries to promote a generalist perspective, encouraging people to live in harmony with the natural environment rather than with an attitude of dominancy. In using an environmental ethic as its ideological core, holistic environmental education promotes the generalist perspective by recognizing the merits of the technocrats and humanists as well as those of the mystics and system theorists so that a realistically balanced approach to the demands and needs of society's environmental degradation is achieved.

Holistic environmental education, then, must become the central, unifying core of the entire curriculum, integrating subjects such that problems are considered from a variety of viewpoints. These viewpoints may reflect traditional academic divisions but will now be seen not as an academic end in themselves but as ways through knowledge, leading to awareness of people in their environment (Clark, 1973).

In order to promote this generalist environmental ideology, educators must consider pedagogical, structural, and content changes so as to encourage holistic environmental education and make the curriculum meaningful to students. Although numerous obstacles stand in the way, such ideological changes are possible. An analysis of the local curriculum will likely reveal numerous opportunities for educators to take a realistic first-step by teaching from an integrative perspective and using the outdoors whenever appropriate. In addition, local school boards, curriculum developers, and Departments of Education need to work at their particular levels to assist teachers in professional development and instituting the necessary content and structural changes. Only by recognizing the need to promote a generalist, environmental ideology, and then working together to promote it through the educational system, will environmental degradation become a concept of the past.

REFERENCES

Bybee, Rodger W. 1979a. "Science Education Policies For an Ecological Society: Aims and Goals," Science Education, 1979b, 62(2), 245-255.

Bybee, Rodger W. 1979b. "Science Education For an Ecological Society," The American Biology Teacher, 41(3), 154-163.

Capra, Fritjof. 1975. The Tao of Physics. Toronto: Bantam Books.

Chen, D. and R. Novik. 1984. "Scientific and Technological Education in an Information Society," Science Education, 68(4), 421-426.

Clark, W.F. 1973. "Integration of the Total Curriculum." In: D. Warwick, Integrated Studies in the Elementary School. London: University of London Press Ltd.

Commoner, B. 1974. The Closing Circle. New York: Bantam Books.

Cotgrove, Steven. 1982. Catastrophe or Cornucopia. Toronto: John Wiley and Sons, 1984.

Goodlad, John I. 1984. A Place Called School: Prospects For the Future. New York: McGraw-Hill Book Co.

Karp, Walter. 1985. "Why Johnny Can't Think. The Politics of Bad Schooling." Harpers, 270(1621), 69-73.

Little, Brian. 1976. "Specialization and the Varieties of Environmental Experience." In Wapner, Cohen, and Kaplan (Eds.), Experiencing the Environment. New York: Plenium Press.

McInnis, Noel, in Troy, Thomas and Karl Schwaab. 1982. "A Decade of Environmental Education" School Science and Mathematics, 82.

New Brunswick Department of Education. 1975. Environmental Studies 112, 113. Fredericton, N.B.: Department of Education.

Ontario Ministry of the Environment. 1983. Environmental Explorations. Learning the Environmental Way. toronto.

Sale, L.L. and Lee, E.W. 1972. Environmental Education in the Elementary School. Toronto: Holt, Rinehart, and Winston Inc.

Sizer, Theodore R. 1984. Horace's Compromise: The Dilemma of the American Highschool. Boston: Houghton Mifflin.

Snow, C.P. 1959. The Two Cultures and the Scientific Revolution. New York: Cambridge University Press.

The Science Council of Canada. 1984. Science For Every Student: Educating Canadians For Tomorrow's World Report 36.

III. D. The Roots of Wilderness Education

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How many of you have seen a hummingbird up close? If you have been fortunate you may have seen the brilliant colors that most hummers have on their throats, on their gorget patches. The color of the gorget is an optical illusion. Little red pigment exists in the feather. The structure of the feather itself catches light, breaks it up, and at just the right angle we see ruby red or flame orange, depending on the species. It takes careful observation to see this. At one angle the color is absent, then flash! As the bird shifts, you see it.

Hummingbirds get their name from the sound produced by their rapid wingbeat. Think of the energy it would take for you to beat your arms that fast. And inside hummingbirds, as in almost all birds, there are hollow bones which provide structural support without extra weight. They are beautifully adapted for life on the wing.

All of this is common knowledge to one who explores the world of hummingbirds. Yet without direct and careful observation these matters easily escape us and the hummingbird remains a mystery. How many times have you seen a hummingbird and gone on? How often do you stop short, knowing that if you had gone a bit further, explored a little deeper, you might have learned something new? Thoreau said it well in Walden: "I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived."

What happens when you go out into the great world, the backcountry, mountains, desert, wilderness? What preconceived notions do you bring with you? Do these notions prepare you for vision, for awareness, for growth? Or do they inhibit these possibilities? How are you prepared for wilderness education?

What is wilderness education?

I like digging for roots: education, educare (L) "to draw out". This implies that something is inside, which goes against the common notion that we are filled up from the outside by what we learn. The root tells us that it is already inside, though it may be hidden from view. Also, there is the sense of moving from the inside out. For our purposes we might recognize this as movement from indoors to outside. Which takes us to wilderness.

The roots of wilderness: wil - deor - ness

Roderick Nash says this means "place of wild beasts".
wil = self-willed (not controlled)
deor = animal
ness = place

Nash contrasts "the place of wild beasts" with the presence of people. He notes that wild is a root for (be)wilder, being lost, confused. So wilderness becomes an alien environment, in opposition to civilization.

Jay Vest of the University of Montana says we must go back farther and look at the word roots in their pre-city, pre-civilized context. Self-willed-animal-place becomes self-willed place or "will-of-the-land". Vest argues that, at root depth, the word extends back before the wilderness/civilization dichotomy existed.

Nash emphasized the contrast between wild and civilized. Vest looks at wilderness as sufficient unto itself, the will-of-the-land, the spirit of the place, with little need of reference to human works or contexts.

Nash says that wilderness is a state of mind. Vest says wilderness is available to, but not dependent upon, our perceptions. Today the meaning of wilderness is not necessarily the root meaning. We need to question our culture-bound attitudes at a deeper level.

This process of deep questioning is a major part of wilderness education. How do you go about it? If you want to draw yourself out to study the will of the land you have to go out to it. That could mean anywhere away from human control and artifacts. Your might learn a bit from reading this paper, but it won't be wilderness education. In the University there is too much talk about things, too much emphasis on Mind.

Going out means being there. Direct contact. What the land is doing, how it cycles through, how if flows...

It is also important to learn about the ecology of place. Again, through direct contact. There are obvious benefits to be derived from studying lizards in the desert, plant taxonomy through field identification, geology through observing the Sierra Batholith.

Growing up in our society, we are grounded in a certain perspective which divides the world into components for rational analysis. There is the ecology of the plant and animal communities you are visiting and there is the ecology of the self in wilderness. But the world is whole. Wilderness education, through direct contact, involves academic and experiential education. You experience and consider your experience. Both are vital; neither is sufficient by itself. The body is connected to the mind through the heavy weight of a backpack full of books, by the rough route over slickrock and the steep mountain pathway.

This direct contact needs to last a while. In the Sierra Institute, you go out at the beginning of a season and don't come back till the weather starts to change. You stay out for eight weeks. The will of the land is not connected to human clocks. You have to be willing to wait. You have to have patience.

This amount of contact allows you to get acquainted properly. You engage your human companions as well as the four-legged and winged and rooted people with whom you are visiting. You get the chance to intermingle. With your companions, this comes out in the friendship and community that builds within the group. Everybody cooks, everybody cleans. It also extends out into the world of non-human beings. Getting to know the neighbors, I call it. With knowledge comes respect for the critters and plants and with respect comes responsibility, "being able to respond to." And minimum impact backpacking techniques are understood simply as good manners in the home of deer, ground squirrel, gopher, snake, and towhee.

Out in the backcountry, this intermingling brings up an important question to the student seeking wilderness education. This is the way Coyote posed it one time a few years ago in the Escalante River watershed, southern Utah:

> It's a question of whether I am visiting or coming home when I go out. Just can't make up my mind about it. I do a lot of traveling you know, my sign is just about everywhere. I mean, I know a lot of dry washes and cool canyons. Couple a hundred mountain ranges too. And where was your daughter last night anyway? Pretty complex scheme, this world. Don't know who the hell thought it up. I mean, take a look at sand for instance. Beautiful fine white river sand. Rich deep red sand. Each grain in that cave over there used to be in these rock walls over here. It's just a matter of movement is what I'm getting at, or is it time or place or are they all three the same thing anyway?

Or another way, from the 1964 Wilderness Act: "A wilderness...is...an area where man himself is a visitor who does not remain."

John Muir: "Going to the mountains is going home".

When we are drawn out of ourselves to experience the will of the land, are we visiting some foreign place or simply entering another room in the house? One way to get at an answer to this question is to recall your own reasons for going into wilderness. Some might be:

1. Get away from the city
2. Go and take a challenging hike for healthy exercise
3. Spend your leisure time

If I was an outdoor recreation researcher or Forest Service manager, I would identify these statements as "wilderness recreation motives." People, tired of the pressures of the urban scene, escape to the outdoors where they can enjoy themselves. To Americans, these are all legitimate reasons to seek wilderness. These motives have a lot to say about the quality and health of our culture, our cities, and our ways of living. But they have little to do with wilderness education.

The Latin root of recreation means "to create anew", refresh, reanimate. To create means to "bring into being." Recreation is an active word and it takes participation on our part to fully engage this re-creation process. There is little of our modern understanding of leisure in the roots of recreation.

If you consider a raft trip only as an enjoyable way to be with friends, drink beer, and stay cool in the summer heat, you are not involved with wilderness education.

If a mountain backpack is simply a means to socialize in a scenic place, you cannot expect to learn much about yourself or the mountains. There will be no chance for vision and wilderness will remain hidden. Our capacity to intermingle and perceive the will of the land, to go deeper, is limited by the attitudes we bring into the backcountry.

When you go out into the hills, move towards bringing-in-to-being (recreating), you may get something like this (quotes from past Sierra Institute students):

Kelly: "Coming into wilderness you learn that you cannot control things. In the technological world the emphasis is on the Known, what will bring productivity, profit. There is no room for change. When you come into wilderness the opportunity for change arises. The opportunity for the unknown to have an effect on you and for you to benefit from that effect".

Reynolds: "We are here, as is everything. We are part of a tie, part of relationship and can be nothing else. We are in a succession, for good and bad, in and out of control. There isn't an otherness - *we are involved*".

Maybe this answers Coyote's question: "We are involved." This is wilderness education in action. John Muir, up in the Sierra, said, "I went out and found out that I was coming home."

Visiting or coming home. It is all bound up with how/where you define yourself. The study of ecology gives us interrelationship as the common ground of existence. In our modern day culture we choose to emphasize individual beings, places. I am *this*, not *that*. Shenandoah National Park begins *here* and ends *there*. Is this really true?

Where Self at the deepest level of intermingling includes the earth, now that is a wonderful level of re-creation. Maybe this is the will of the land, the wilderness we seek. And if we are open and disciplined and fortunate enough to experience this then the *practice* of these lessons becomes self-evident.

Which means, in the late 20th century, political action, ecological resisting, defending the parts of Self that are hurting: roadless areas in the West awaiting 75,000 miles of new logging roads, tropical rainforests cut down to the brink of extinction (winter home of hummingbird), population growth that continues to eat up the planet, topsoil blown away in the breeze of agribusiness...

After education, after the opening of wisdom, comes compassion: the practice of assisting all begins, all parts of Self towards responsibility. This is wilderness education.

How shall we respond?

III. E. *The Role of Environmental Ethics in Environmental Education*

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Environmental ethics is a new field within philosophy and represents the environmental side of the applied movement in professional philosophy. In the last ten to fifteen years a great deal of work has been done in this field, much of it published in the journal I edit, *Environmental Ethics*.

Someone approaching this material for the first time is likely to be puzzled by the varied and often seemingly bizarre positions taken by environmental ethicists. It is important at the outset to realize that the entire history of philosophy from Greek times on has been fundamentally incompatible with environmental thought. The history of ideas which formed contemporary environmental intuitions and perspectives developed independently of philosophical assistance. Thus, to a large degree environmental ethics requires a reexamination of the entire history of philosophy in ways that may not seem important at first, but which are essential if environmental thought is ever to be firmly grounded philosophically and ethically.

In addition, environmental ethics is not especially user-oriented for still another reason: environmentalists are not very interested in having philosophers tell them what to do. Perhaps the most established applied ethics area is medical ethics. Here the emphasis is on how to deal with tough cases, what to do in delicate situations, how to use new technology. The doctors do not know the answers and they want philosophers to give them specific advice. Environmentalists, in contrast, are not especially interested in dealing with tough cases. They do not want to know so much what to do, but rather _why_ to do it. The emphasis is on justification, not decision-making. Environmentalists already have strong intuitions about what needs to be done in most cases. These intuitions, however, exist as feelings and are not properly grounded conceptually in analysis.

In approaching the field of environmental ethics, it is important that environmentalists recognize that it is very unlikely that work in this area will ever produce a single set of rules or values which compose a single, universally accepted environmental ethic. There is no single ethic in philosophy. Study and research in ethics in general over the last two thousand years, moreover, has tended to create more positions, not less. The same will be true in environmental ethics.

Because there will never be a time when an environmental ethic is finished and ready for public use, there is no need for environmental educators to wait. They should use what is currently available plus their basic intuitions, while keeping an eye on environmental ethics research, and especially keeping up with new terminology as the theoretical debates continue.

While it may seem a terrible burden for educators to be working from imperfect principles, actually the situation is less traumatic than it may seem at first, especially when one attends closely to the way in which people develop decision-making skills. To see how one deals with decision-making morally, it is useful to consider a simpler case--chess decision making. (What follows is in part a summary of a longer discussion, "The Role of Rules in Ethical Decision Making," _Inquiry_ 28 [1985]: 3-42.)

Adriaan de Groote, in his book, Thought and Choice in Chess (The Hague: Mouton, 1965), carefully analyzes what goes on in the mind of a human being when he or she makes one move in chess. What de Groote demonstrates conclusively, but fails to note, is that human beings almost never apply rules when making moves. Rather they simply mumble to themselves something like: "If I do this, then he'll do this, etc." In actuality, chess players at all skill levels already have a number of possible moves in mind when they start evaluating the position. They simply look at these over and over again until they chose one of these. At first de Groote thought it strange that "immediate and nonimmediate investigation" of the same moves occurred over and over and it attributed it to poor memory on the part of less-skilled players. However, because the pattern was the same even with international grandmasters, he was forced to conclude that something more must be going on. As it turns out, each attempt to find solve the problem (find the best move) also serves to further clarify the nature of the problem being solved. As a result, the problem itself is in flux until the preferred move is decided upon. When the problem evolves, the player goes back to his short list of favorite moves to see if they are good solutions to the problem in its new form. Because the problem is not completely determinate until the move has been determined, the player cannot apply a rule straightforwardly. To apply a rule, the player must first know what the problem is. He doesn't know that until he has determined the solution--and by then it is too late to apply the rule. As it turns out, rules are usually only applied in chess decisions when the player finds himself in such a boring board situation that there is no problem. In such cases, he may decided, for example, to double his rooks, since in principle that it is a good thing to do, although he sees no particular advantage in his particular situation.

The fact that rules are not normally used in decision-making, however, does not mean that rules are completely useless. If you ask almost any player why he or she made this or that move in a game, most likely you will not be treated to a phenomenological report of the thinking process involved. Rather the player will state a rule and claim that it was simply a matter of applying the rule to that particular case. What this shows is that, regardless of their utility in decision making, the rules used in learning how to play chess are the central focus of justification and explanation.

Moreover, although the rules are not consciously applied, there is some evidence in de Groote's book that they are influential unconsciously. De Groote used one board situation in which the exchange of a bishop for a knight won a piece, obviously influenced by the beginner's rule that knights should be exchanged for bishops, but not vice versa, since the power of bishops usually increases, and the power of knights decreases, during a game. This suggests that the learning of rules affects perception even when the player is not consciously thinking about them.

The double role of rules in chess, shaping perception in decision-making and providing principles of justification, can serve as a useful model for environmental ethics. Chess rules are especially good because they, like ethical rules, do not form a consistent, straightforward system. Chess rules are not universally true. Following them in some cases will lead to bad results. Some rules are in conflict with others; to follow one means in many cases that you cannot follow another.

Until the middle of the nineteenth century, the best chess players were intuitive in their approach. They play of the best of them, Adolf Anderssen, could not be reduced to rules or principles. At that time, however, it was discovered that rules could be formulated in terms of the play of Paul Murphy, which when taught to others immediately improved their performance. A half century of research into the rules of the open game, the closed game, and the half-open game followed. Eventually, chess theoreticians came to believe that it was only a matter to time before all the rules would be discovered and a new game would have to be developed. At that time, however, the hypermodern reaction occurred. The hypermoderns began formulating rules which were the opposite of those then in use; incredibly, they were able to win using them. As a result, the idea that there was one scientifically verifiable set of principles for good play died forever.

The hypermodern rules, nevertheless, were in general not very useful in helping beginning chess players learn how to play well. In fact study of the theories of hypermodern theoreticians like Aron Nimzovitch, can actually lead to a marked deterioration in game play. The principle, "Develop your pieces so as to control the center," continues to be more useful than the hypermodern principle, "Develop your pieces to the sides so that your opponent's center becomes so strong that it becomes weak." Applied by someone with the intuitive abilities of Adolf Anderssen, the second is quite useful. Ordinary players, however, benefit from the former, but not the latter.

In the nineteenth century, environmental intuitions and attitudes took a modern form and they had great influence, especially with regard to efforts to create national and local parks and to preserve wildlife. These intuitions and attitudes, however, were not developed out of any particular set of moral principles. To a large degree, it is the task of environmental ethics in this century to provide the rules or principles which explain and justify these attitudes and intuitions.

In this regard, the environmental ethicist is similar to a tailor, asked to design a piece of clothing on the basis of some vaguely articulated comments by a customer. The results can be varied. The end product may be not what the customer wanted at all, better than what the customer wanted, or more or less what the customer thinks he or she wants, the product may prove more or less useful, just as some chess rules help new players learn how to play well better than others. What we need to aim for in environmental ethics, as in chess, are rules that serve well both as an aid to developing good perception in decision-making and as principles of justification once the decisions are made.

There are, it turns out, as in the case of the opposition of scientific and hypermodern principles in chess, conflicting principles that lead to the same results. In animal liberation, for example, the principles that animals have rights that should be respected or that humans have lost the right to do whatever they want with animals can both serve as a justification or explanation of the moral change in the nineteenth century in which humans started acting as if it is morally wrong to inflict unnecessary suffering on animals. They will not, however, serve equally well when moving on to tough cases in which our basic intuitions offer little help.

William Bennett, Secretary of Education, has argued as a philosopher that the teaching of applied ethics promotes skepticism and will, if it continues, bring about the fall of Western civilization. Applied ethical principles, however, are in no more disarray than the principles in chess; beginners over the last hundred years have used these principles with profit in developing decision-making skills. The same should occur in applied ethics teaching.

III. F. How Much of the Earth is Sacred? A Comparative Study of Sacred Space

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One of the happiest events of recent years was the return of Blue Lake to the Taos Pueblo. This is a holy place for the Taos people, who say "We go there and talk to our Great Spirit in our own language, and talk to Nature and what is going to grow."[1] In giving back the lake, Congress acknowledged, as it later did more explicitly in the American Indian Religious Freedom Act,[2] that Native American Indian tribes recognize certain places as sacred. This is true of all tribes; the Lakota have a spiritual relationship to Bear Butte and both the Navajo and Hopi to the San Francisco Peaks, although the courts have been remiss in protecting them.

Sacred space is a place where human beings find a manifestation of divine power, where they experience a sense of connectedness to the universe. There, in some special way, spirit is present to them. But when one asks a traditional Indian, "How much of the earth is sacred space?" the answer is, "All." Chief Seattle said, "Every part of this soil is sacred in the estimation of my people."[3] When tribal elders speak of Mother Earth, they are not using a metaphor. They perceive that earth is a living being, sacred in all her parts. Black Elk addressed her: "Every step that we take upon You should be done in a sacred manner; each step should be as a prayer."[4] For this reason Smohalla required his followers to use the gentle digging stick instead of the plow, which tears Mother Earth's bosom like a knife.[5] These venerable teachers knew that one could experience a sense of connectedness to the universe in each place, so there were no boundaries and no places that were not sacred.

This does not contradict what was said before about sacred places. In the traditional Indian view, all nature is sacred, but in certain places the spirit power manifests itself more clearly. It is to these places that a person seeking a vision would make a quest. These were the places where the great events of tribal history and the era of creation took place. So the Indian view of the universe is that of a sacred continuum which contains within itself foci of power.

The Old World produced in ancient times another view that contrasts with the one just sketched, and which has had a pervasive influence in European Civilization. This is the idea of a sanctuary as an area marked off so as to be separated from the space around it, usually by a wall. The Greek word for such a place, *temenos*, derives from the verb *temno* meaning "I cut off." The Latin word *templum*, the root of our word "temple," also means "a part cut off." Once dedicated, such a precinct was protected by the sanctions of religious custom and local law. Within the boundary, all use other than religious worship was forbidden. There was to be no cutting of wood, no hunting, grazing, or cultivation. The only building permitted was a shelter for the statue of the god or goddess. What we call a temple is that structure, but for the ancients the enclosure itself, and everything within it, was the temple. There a fugitive could seek sanctuary, a sick person could ask for healing, and anyone seeking wisdom could sleep overnight in expectation of a meaningful dream.

But setting physical boundaries for sacred spaces implicitly gives another answer to the question, "How much of the world is sacred?" That answer is: "As much as has been consecrated to the gods." Outside the limits, the gods no longer protected the earth, and people were free to use it as they saw fit. Thus an enormous step had been taken toward the desacralization of nature, but it is also true that the boundaries themselves had been endowed with numinosity.

In order to understand how the concept of sacred space entered the European mind, we must also consider how the ancient Hebrews transformed it. The psalmist proclaimed: "The earth is the Lord's and the fullness thereof, the world and those who dwell therein."[6] The Hebrews had sacred places: Sinai, where God gave the commandments to Moses, and Bethel, where Jacob wrestled with the angel. But the dominant view in Judaism held that God is not to be identified with His creation, even though it might serve as a sign of His power and benevolence. Since God is transcendent, He cannot be said to dwell in any spot on earth in an ontological sense. The designation of a particular locale as sacred space could be considered arbitrary. King Josiah centralized the sacrificial worship of the one God in a single sacred space, the Temple of Jerusalem. Even though Mount Zion was undoubtedly a sacred place before it was reconsecrated for the Temple, the Judaic belief is that it was holy because it had been sanctified by God's people at God's command, not because of any special sacredness inherent in the spot. So while the Greeks may be said to have recognized sacred space in the landscape, the Hebrews declared the Temple space to be sacred.

With Christianity, a further step was taken. The early missionaries were anxious that their converts should not confuse the creation with the creator. Paul the Apostle taught that the natural world had fallen along with mankind and needed to be redeemed through the work of Christ. John urged the Christians not to "love the world or the things in the world."[7]

The New Testament does not teach that nature is evil, but that even in its fallen state it exhibits the eternal power and deity of God. The sacraments show natural creation as a vehicle of the grace of God. But Christians were not encouraged to look for sacred space within the world of nature. For them, churches and monasteries were sacred space, with the enclosures that adjoined them, filled with trees that sheltered the burial places of the sainted dead. As outposts of heaven on a fallen earth, they could be established anywhere, though it was considered an act of merit to establish them on the former sites of temples as signs of victory over the pagan gods. The threshold of the church divided two different kinds of space, and boundaries retained a religious sanction.

By the time Europeans were ready to undertake the invasion of the homeland of the American Indians, the idea of sacred space as a distinct area, consecrated by ecclesiastical authority, was firmly established. In addition, the concept of a boundary as a sacrosanct limit, whether marked by a wall or an imaginary line, had the force of millennia of tradition. The meeting of the two peoples was foredoomed to cultural conflict, therefore, as neither could understand the perception of sacred space held by the other.

A further development, however, was taking place in Europe in regard to sacred space, and that was the final step in the desacralization of nature. The forces of nationalism and private property asserted their own claims against the Church, both on the practical and philosophical levels, and the claim even of Church land to be sacred space was questioned. But boundaries retained inviolability, whether of nations or of private land. Trespass was treated as a heinous violation of the European order.

Indians were incredulous at the idea that the earth could be divided by a line drawn on a map. How could Mother Earth be cut up in that way? When Tecumseh said "Sell the earth? Why not sell the air, the clouds, the great sea?"[8] He was protesting not against commercialism, but sacrilege. For their part, Europeans were angered at the failure of Indians to respect their boundaries. To Europeans, treaty lines were sacred, even if they crossed territory a European had never yet seen, and the fact that Indians would return to hunt on traditional tribal lands after they had become royal or private property was to them a profanation. For Europeans to violate boundaries in the other direction was not a similar trespass in their minds, since they convinced themselves that Indians did not really "occupy" or "use" land. Indian sacred space was not respected because Indian religions were regarded not as "real" religions, but "superstitions," and Indians were expected to accept the new order, either by becoming Christians or by withdrawing beyond the frontiers.

From the standpoint of the European view of sacred space, the Indian Reservation is an anomaly. Once the boundaries had been set, and Indians recognized as the proper occupants of the enclosed land, all the forces of legality and centuries of customary attitudes should have caused the Europeans to respect them. That they did not shows the triumph of greed over law and the relict religious feelings. An engine for the destruction of the reservations was constructed called the General Allotment Act, whose provisions were an imposition of European law on Indian tradition, and whose justification was a pious fraud. Claiming they intended to acculturate the Indians by giving them private property, the administrators of the Act alienated two-thirds of all Indian land within 50 years. This process showed no concern for the preservation of Indian sacred sites. In fact, Indian religions were denied the protection of the First Amendment to the U.S. Constitution during the same period, and an effort was made to stamp them out through proscription of the religions themselves and reeducation of Indian children.

At the same time, a similar greed for land and resources was destroying the wilderness. There is a close relationship between wilderness places and the sacred which has always existed in the Indian conception of the world, so that the exploitation of wilderness areas infringed on countless Indian holy sites. But during the nineteenth and early twentieth centuries a new application of the concept of demarcating sacred space appeared in America. This was the movement to preserve natural areas from despoliation as national parks, forests, and wilderness areas. It was motivated in large part by what one can only call a concern for the sacred. True enough, it was not an expression of ecclesiastical religion, but its most vocal exponents had recovered the perception of sacred space. Deeply religious, they were highly unorthodox. they found their temples in the wilderness, not in churches. And these conservationists did regard wild nature as sacred.

John Muir, whose role in the protection of national parks was enormous, believed he was saving sacred spaces. He spoke of mountains and meadows as places of healing, renewal, and worship. What better statement, if the sacred is a feeling of connectedness with the all, than Muir's words, "The clearest way into the Universe is though a forest wilderness."[9] Muir found Eden in the wild places, saying "I have discovered that I also live in 'creation's dawn.'"[10] "In God's wildness lies the hope of the world."[11] And when Hetch Hetchy, one of the places he honored most, was threatened with destruction, he stated the principle of its sacredness:

> These temple destroyers, devotees of ravaging commercialism, seem to have a perfect contempt for Nature, and, instead of lifting their eyes to the God of the mountains, lift them to the Almighty Dollar. Dam Hetch Hetchy! As well dam for watertanks the people's cathedrals and churches, for no holier temple has ever been consecrated by the heart of man.[12]

Why did this movement in America go so far beyond its precedents in the Old World? Possibly because of influences from the American Indians, influences that have been unrecognized. Perhaps these lovers of nature were finally putting down spiritual roots in the land, and encountering the fact that Indian tribes had already established a relationship with the earth through thousands of years of tradition.

Significantly, George Catlin, the artist who did much to rescue the culture of Indians in the 1830s from oblivion, was the person who first suggested that a national park be set aside to preserve not just the landscape and wildlife, but also the way of life of the Plains Indians.[13] Others who developed the philosophy of conservation in America, such as Henry David Thoreau and John Wesley Powell, had many opportunities to learn

Indian attitudes toward nature firsthand. John Muir records conversations in which Indian elders spoke to him about their perceptions of their land and the animals on it, and he was given an Indian name and adopted into the Tlingit tribe.[14]

But when national parks were created, unfortunately little provision was made for the Indian people who lived in them. In actual practice, the Park and Forest Services worked out a method of issuing special use permits for Indians who lived in or used the areas, although there were a few cases of attempted eviction. Especially important is the fact that the outstanding natural features that caused the parks to be created were usually themselves sacred places in tribal traditions.

Indians understood the purpose of the parks and forests, and the laws designed to protect the animals and plants within them. But they were frustrated by the way these were administered to interfere with their religions. As a member of the Crow tribe stated, "The laws that protect birds, animals, plants and our Mother Earth from people who have no respect for these things serve to inhibit the free exercise of religion...and free access to religious sites when these American Indians pose no threat to them."[15] For most of this century, no consistent policy granted Indians access to their sacred places, and developments often committed desecrations in Indian eyes.

In recent years, a more considerate attitude has been reflected in Congressional action, although it still remains to be put into practice fully. Let us return to the American Indian Religious Freedom Act (AIFRA) of 1978, which guarantees the right to "believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiian."[16] The law charges all U.S. governmental agencies to consult traditional religious leaders in order to preserve Native American religious rights, and to inventory all sacred places on Federal lands and come up with proposed policies of management that will preserve the traditional religious values associated with them. The law, it seemed, came none too soon, because surviving American Indian sacred places have never been so threatened with destruction as they now are.

The law is an expression of pluralism, that is, the recognition that all communities are equally entitled to protection of freedom of religion, and that in applying this principle to Native Americans, the special role of sacred spaces in their religions must be acknowledged. But court cases brought under the law to protect American Indian sacred sites have failed with one or two notable exceptions.[17] In most of these cases, use by the general public in the form of reservoirs or recreational facilities took precedence over

Native American religious rights. Even in a case which succeeded at least initially, where the Yurok, Karok, and Tolowa tribes of northern California managed to block construction of a road near their traditional mountain prayer sites, their First Amendment rights, not AIRFA, were held to be decisive.[18] One case where AIRFA appears to have helped was in the denial of a license for Northern Lights, Inc., to build a water project that would have destroyed Kootenai Falls, a sacred place of the Kootenai Tribe.[19] Weaknesses of AIRFA are that it is only an advisory resolution of Congress directed at federal agencies, it has no enforcement provisions, and it offers no help in weighing American Indian religious rights against other rights and interests. A federal agency may comply with AIRFA by considering Indian rights; it does not have to decide that they take precedence over skiing, dirt-biking, or electrical power generation. Perhaps American Indian religious freedom in regard to sacred places can only be guaranteed by a stronger and more carefully drafted law.

But underlying the ineffectiveness of AIRFA is a failure to recognize the differences between the American Indian and European concepts of sacred space. In the successful Yurok-Karok-Tolowa case mentioned above, usually called the "G-O Road Case," the court defined sacred space in terms of the federal land survey, designating sections of land which were to be kept free of road building and timber harvesting.

These are the kind of provisions that have been used in demarcating sacred land in the European tradition. Modern officials, without realizing it, are acting like ancient Greeks delimiting a _temenos_, except that, following both the Judaeo-Christian tradition and modern secular thought, they are doing so without believing that there is anything inherently sacred inside the lines they are drawing.

Traditional Indians, on the other hand, are faced with difficult alternatives. They can accept the decisions of the land managers and/or bring cases in court to win orders like the G-O road decision, thus saving a few shattered fragments of their heritage and leaving unchallenged the non-Indian idea that sacred space is "as much as has been set aside," and no more. This does have the advantage of using federal law to achieve a measure of justice. Another course seems to offer less hope of immediate practical success, but could open a dialogue and raise the national consciousness. "Some traditionalists have claimed that in keeping with their religion, all land on which the tribe has lived, celebrated, and worshipped in the past is sacred and hence essential to tribal free exercise of religion. Such a claim was made before the Federal Agencies Task Force by the combined nineteen Pueblo representatives and in Senate testimony on the [AIRFA] resolution by Yakima representatives. It has also been made in court by the Sioux, the Hopi, and the Navajo."[30] The Ghost Dance prayed for the renewal of the whole land, and the spirit of that prayer did not die at Wounded Knee. But the Federal law lacks the same vision. Without realizing it, Congress promised far more than it can deliver. Congress and the courts have not even begun to deal with the basic traditional tribal principle that Mother Earth, as a holistic entity, is sacred.

Another fact has to be considered. There are articulate and influential individuals in America today who are recovering the ancient idea of the sacredness of the earth. They hold, not as a fad or pose but as a deep conviction, that wilderness is sacred ground, and that visits to places of power enhance wisdom and health. They advocate that we should learn to know the earth, and the plants and animals that inhabit it, in the places where we live. They feel, as Indians long have felt, that human beings are not the lords of creation but fellow creatures with the bears, the ravens, and the running streams. Who are these people? They have as yet no name and no church, and perhaps they never will. Gary Snyder is one of them, and Paul Winter is another. It is interesting that the first two who come to mind are a poet and a musician. The writer Wendell Berry is another, and a significant one, although he speaks more characteristically of the inhabited place rather than the wilderness. The idea that the place where one lives is sacred space is alien to the European tradition, in which it is sundered. But to live in what one regards as sacred space is the most forceful affirmation of the sacredness of the whole earth. Snyder has made a deep and sympathetic study of Indian traditions, and both Winter and Berry acknowledge the closeness of their ideas to Indian insights.

We are now at the point where a dialogue can take place. The Indian sacred places that remain, the places of power within the sacred continuum, must be preserved. The law offers a place to start, and it can give the people who believe in the sacredness of these places a position of strength from which to speak. One is encouraged by the fact that, as in the G-O road case, environmental groups and Indian tribes have joined together. This has happened because both Indians and environmentalists wish to keep the sacred space in its natural condition. And their motives in wanting to do this are not incompatible. This situation should encourage the two groups to engage in a wider dialogue, in which others may learn something about the conception of sacred space that Indians hold, while Indians can hear other Americans who feel in their hearts that many of the same places are sacred. Some of the sites, by their nature, must be kept secret and closed to outsiders, and there is provision in the law to do this. In the Kootenai case, Kootenai tribal elders were allowed to give "limited distribution" testimony, presumably locating sites and documenting their sacred character, but this testimony did not become part of the published court record and its secret nature was preserved.

But many of the places that need protection are great shrines which should be held open for most of the year as places of prayer for all people. Of course, this has to be done in a way that will prevent gross intrusions, vandalism, and theft of holy objects by visitors who do not honor sacred space.

The conversation can begin; indeed, it has begun. All those who participate in it can be willing to learn. And it is true that recent developments in science must make us consider the likelihood that it is the Indian view of sacred space that is correct. Ecology shows us the intimate way in which all parts of the biosphere are interconnected with all others. The living surface of the earth as ecologists see it is a net in which there are important foci of energy. We cannot allow the net to be broken in too many places without destroying the most basic processes that sustain us. The scientists, James Lovelock and Lynn Margulis, have advanced a theory called the Gaia hypothesis, which postulates that the living systems of the earth, the animals and plants, collectively called the biosphere, regulate the atmosphere and climate so that they will support life.[21] If we grant the truth of the Gaia hypothesis, it seems that we humans are likely to act to keep this system functioning only if we recognize that every part of it is sacred in the sense of being connected to the whole. Recognizing this, we will know that all the major decisions which we as a society must make which affect any part of the natural environment are decisions about sacred space. Thus the visions of tribal elders can combine with the most daring new conceptions of ecological scientists to show us how to see the wholeness--the holiness--of the earth, and how we must act while we live together here.

ENDNOTES

[1] John Collier, On the Gleaming Way (Denver: Sage Books, 1962), p. 124.

[2] PL 95-341, 1978.

[3] W. C. Vanderwerth, ed., Indian Oratory (Norman: University of Oklahoma Press, 1971), pp. 120-121.

[4] Black Elk, The Sacred Pipe, ed. by Joseph Epes Brown (Norman: University of Oklahoma Press, 1953), pp. 12-13.

[5] James Mooney, "The Ghost-dance Religion," Fourteenth Annual Report of the Bureau of Ethnology (Washington: Government Printing Office, 1896), p. 724.

[6] Psalm 24:1.

[7] I John 2:15.

[8] Stewart Lee Udall, *The Quiet Crisis* (New York: Holt, Rinehart & Winston, 1963), p. 20.

[9] Edwin Way Teale, ed., *The Wilderness World of John Muir* (Boston: Houghton Mifflin, 1954), p. 312.

[10] Ibid., p. 311.

[11] Ibid., p. 315.

[12] Ibid., p. 320.

[13] George Catlin, *Letters and Notes on the Manners, Customs, and Conditions of the North American Indians*, 2 vols. (Reprint. Minneapolis: Ross and Haines, 1965), Vol. 1, pp. 261-262.

[14] John Muir, *The Writings of John Muir*, 10 vols. (Boston: Houghton Mifflin, 1919), Vol. 3, pp. 208-211.

[15] Hearings, Senate Joint Resolution 102, February 24, 1978.

[16] PL 95-341, 1978.

[17] E. g., *Badoni v. Higginson* (1977-1981), regarding Navajo rights at Rainbow Bridge, Utah; *Sequoyah v. Tennessee Valley Authority* (1979-1980), regarding Cherokee rights in the Little Tennessee Valley; *Wilson v. Block* (1980-1983), regarding Hopi and Navajo rights in the San Francisco Peaks, Arizona; and *Frank Fools Crow v. Gullet* (1982-1983), regarding Lakota Sioux and Cheyenne rights at Bear Butte, South Dakota.

[18] *Northwest Indian Cemetery Protective Association v. Peterson* (1982-1983), N. D. California.

[19] Federal Energy Regulatory Commission, Northern Lights, Inc., Project No. 2752-000.

[20] Robert S. Michaelsen, "The Significance of the American Indian Religious Freedom Act of 1978," *Journal of the American Academy of Religion*, 52 (No. 1, 1984): 93-115; see pp. 108-109.

[21] James E. Lovelock, *Gaia: A New Look at Life on Earth* (Oxford: Oxford University Press, 1979).

III. G. Built on Honor to Endure: The Evolution of the Leopold Family Philosophy

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A Man and His Son

Early one autumn morning around the turn of the century, a man and his son arise and dress by the dim light of a gas lamp. Believing in a stick-to-the-ribs-meal, they breakfast on last night's pork and beans, prepare a light lunch, and head out the door with one gun and one stick. They catch the early train from Burlington, Iowa across the Mississippi River to the Illinois side where the bluffs are set back and the land is a broad expanse of wetlands. The ride costs them 12 cents each.

Arriving just before sunrise at the hunting club, this party of two heads out toward the lakes and swamps where migrating ducks are sure to have spent the night. It is a typical duck hunting day. A cold chill is carried by a north wind under cloudy skies that threaten snow. Early hours are spent jumpshooting or flushing ducks from their night's resting place, the father spending as much time carefully watching his son as watching for ducks.

A bird takes to the air. The boy jumps back startled while the father folds it up with his single-action shotgun. The boy, excited, beams with pride as the father attaches it to his belt and continues on.

At lunch time, they sit for a few minutes sheltered by some Pin Oaks at the east end of the hunting club grounds. A piece of bread and a hunk of dried meat are enough to carry them through the afternoon.

They spend a lot of the afternoon just looking around, comparing the sightings of game and advance of the season to previous years and wondering why. They find a mink's den and speculate as to what the mink might be doing, all the time the father's watchful eye on his son. Is he ready for the next step in his training, the privilege of carrying an unloaded gun? Does he understand why they're hunting the way they are?

By evening, they have five or six Mallards and maybe a Black Duck or Canvasback, plenty to provide a meal or two before the meat spoils. There is no refrigeration. They get off the train just after dark. The boy's arms are weary from carrying his stick all day, but he wants to carry the game the last 100 yards up the hill to the house. With pride, he sits down in front of the fireplace, smooths the feathers, and lays each bird out to be admired while the events of the day are recounted and recorded. Guns are carefully cleaned, oiled, and replaced in their proper place.

Plenty tired, physically and intellectually, they eat, bathe, and go to bed. The father's last thoughts are of his son. Will he be able to take his children hunting?

Built on Honor to Endure

The man's name was Carl Leopold, son of German immigrants and manager of a wood office furniture manufacturing firm in Burlington, Iowa. In the late 1880's, Mr. Leopold chose an advertising motto for his company that represented his ideas about the company and the product. "Built on Honor to Endure" not only described his business ethic but also described his attitude toward his family, home, and the environment. Each of his sons and his daughter had an opportunity to learn from their father the ways and hows of hunting and enjoying the out-of-doors. Mr. Leopold's approach toward the education of his children was not to teach, but to share. By setting an example and asking "Why?", he helped them develop a sense of wonder, a curiosity, and a desire to understand why. Mr. Leopold possessed a gift of foresight and the patience required to guide his children in discovering for themselves the changes that were occurring around them.

Aldo Leopold, Carl's oldest son, was especially touched by this gift. In the dedication of his book, Game Management, Aldo wrote, "to my father, pioneer in sportsmanship". Aldo Leopold gave his father credit for planting in him the seeds of an environmental ethic and providing the opportunity for them to germinate. Time, study, and contemplation of those things about which he cared allowed Aldo Leopold to develop and write of an attitude toward the environment which he called "The Land Ethic:"

> A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise. (Leopold, 1949).

This statement condenses Aldo Leopold's Land Ethic into a single sentence. Although it is elegantly simple, arriving at it and articulating it were time- and thought-consuming processes. Leopold spent most of his life learning about the natural world. He believed that knowledge about the natural world, the names of plants and animals, were as necessary a part of education as learning the alphabet. However, Leopold felt that flora/fauna taxonomy alone was not sufficient. Understanding and appreciation for the natural world could be derived from knowledge, as words and sentences are derived from letters of the alphabet.

Maturity and understanding led him to write, "Pluck a petal from a Pasque flower and you disturb a star" (Leopold, 1949). This was his interpretation of a basic tenet of ecology--that the individual is a member of a community of interdependent parts.

This was an important leap in Aldo Leopold's thoughts. The next step, logically, was a sense of responsibility for the health of this larger community. In other words, he extended his sense of right and wrong, his ethics, to include the land--the soils, waters, plants, and animals.

> We abuse the land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect (Leopold, 1949).

To Leopold, the Land Ethic was not just a basis for professional decision making but a life style. This meant taking responsibility personally for the health of the land and for educating others, especially one's own family, to act as guardians, not owners, of the land community. Living this ethic meant providing a good example.

Leopold Family Systems for Promoting an Environmental Ethic

Through several generations of the Leopold family, the hunting experience has been used as a primary means of introducing the young to the natural world. The term "Enlightened Hunting" was chosen to make distinct the difference between hunting as it has been practiced by the Leopold family and hunting as it has been traditionally defined. "Enlightened Hunting" is the pursuit of understanding of the natural world. The quest for game is but a subset of the experience. Hunting, as it is traditionally defined, involves the stalking and killing of game. Those who participate successfully in hunting have generally achieved a basic understanding of the habits and behaviors of the quarry they seek. The following characteristics, however, define and distinguish "enlightened hunting" from the more traditional hunt:

1. Enlightened hunting involves the search for understanding of interrelationships in the natural world. Therefore, carrying a weapon is not required; the enlightened hunt can occur in any season.

2. Enlightened hunting involves careful observation of the natural world and continuous questioning, "Why?"

3. Success in enlightened hunting is measured in the amount of understanding and enjoyment gained. Returning with game is fine, but it is not the primary measure of success.

4. Enlightened hunting involves learning. It is important that this learning be shared and preserved. Sharing may involve other family members; preserving may include keeping records or a journal.

5. Enlightened hunting represents Aldo Leopold´s "Land Ethic." Participants in enlightened hunting reap the benefits of the natural world without waste. Enlightened hunters live in harmony with the natural world and give back to nature, in the form of stewardship, more than they take.

6. Finally, enlightened hunting requires intelligent appreciation of the natural world, curiosity, and creativity.

Education, in the form of enlightened hunting, may have been the main influence behind the high degree of ethical development seen in selected members of the Leopold family. Estella Leopold, Aldo Leopold´s youngest daughter, wrote of outings with her father:

> There was much stopping and discussing tracks and sign, what it was eating, etc...Whether we were hunting or not, long walks with Dad always involved these kinds of ecological analyses....All this made the biotic community very real and very interesting (Leopold, E., 1985).

Aldo Leopold´s youngest brother, Frederic, lives in Burlington, Iowa, and has fulfilled his responsibility for the education of the next generation with great success. His grandson, Jim Spring, spoke of his grandfather:

> I´ve been very fortunate to grow up with this character because from day one, when we would go out walking, not just hunting, anytime of the year, we were observing constantly. He always wants to ask ´Why?´, which is a classic scientific approach. You don´t just go out and take a walk but you start looking at things and analyzing them and try to see the interaction that´s taking place. You see a tree that grows up in the woods at a strange angle, and you see, thanks to his observation, thanks to his help, that the tree didn´t just do that by chance. There used to be larger tree there that´s no longer there. It made the younger tree have to reach out from under it to get to the sunlight. And it may be a hundred and fifty years old now, but there used to be another tree there. And it´s little touches like that....it was always very subtle, never overt, handling a gun, I carried it empty for a long time and he was always watching me, subtly watching me. You took it very seriously!....It´s respect that is the underlying theme of his approach to life (Spring, 1984).

Perhaps some means by which ethical development can be approached can be learned from this family. Perhaps generalizations can be made concerning the content and process by which the Leopolds taught members of the younger generations. Keen personal interest and a one-to-one teaching relationship seem to have been preferred. The instructor was continually learning himself. He was a perceptive questioner and one who was knowledgeable about the natural world. These characteristics added strength and credibility to the "instructor" in the eyes of the student.

In the late 1880's, Carl Leopold chose for his company the motto: "Built on Honor to Endure". This phrase expressed his personal philosophies and values. These philosophies and values were reflected in his business and personal habits. Values such as respect, honor, and pride have traditionally been thought of as "old-fashioned." However, they have not yet been universally applied to the natural world. This is an ultimate goal of environmental education. This project is the result of one look back into the past in order that the Earth can be sustained for the future.

REFERENCES

Leopold, Aldo. A Sand County Almanac. London: Oxford University Press, 1949.

Leopold, Estella. Unpublished letter, 1985.

Spring, Jim. Leopold Family Oral History Tape Seven. Burlington, Iowa: Des Moines County Historical Society Museum, 1984.

III. H. Thinking Like a Planet: The Promise of Momo Custodians

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In 1968 I co-authored an anthology of environmentally related articles entitled Can Humankind Care for the Earth? Its intended publisher initially declined the manuscript because "nobody else is asking that question." In 1970 the publisher reconsidered, and a modest printing appeared with "man" substituted for "humankind" (Can Man Care for the Earth?:Nashville, Abindgdon Press, 1971).

Although the book is long since out of print, its question has never left my mind. In 1968 I considered the question to be an open one. Today, I feel more definite about an answer:

Can humankind care for the Earth? Yes.
Can *homo sapiens* care for the Earth? No.

I came to this conclusion after reading the description by physicist David Bohm of a power infinitely greater than that of nuclear energy. This power, called zero quantum energy, is uniformly distributed throughout the universe and may be its binding energy matrix. Sudden liberation of the zero quantum energy within any cubic centimeter of the universe, *a la* a nuclear bomb, might obliterate the entire cosmos.

In the 80 years since Albert Einstein revealed the comparatively minuscule power inhering the nuclei of atoms, we have shown scant evidence of being its appropriate custodians. Is our species ready for zero quantum energy?

I suspect not. *Homo sapiens* seems only wise enough to be the long-sought missing link between the apes and truly civilized human beings. At our best we have learned, as Aldo Leopold, to think like a mountain. Caring for the Earth requires human beings who think like a planet. Fathoming zero quantum energy may require human beings who think like a cosmos.

Our species can, at best, minimize its care*less*ness for the Earth. Such, realistically, seems to be the best possible outcome of our efforts as environmental educators. It will take far more than education, values clarification, attitudinal healing, and personal transformation to produce a custodial species. *Homo sapiens* is no more capable of caring for the Earth than our predecessor species were capable of Los Angelizing the Earth.

Today's environmentalists are therefore not the ultimate planetary caretakers. Rather, we are precursors, a bridge across the evolutionary gap between our species and the one that will succeed us: *homo custodians*. The persons to whom environmental educators will make the most sense are only now being born in sufficient numbers to assure that humankind may one day indeed "replenish the Earth," thus fulfilling that portion of the Great Environmental Commandment that we have ignored in our eagerness to multiply, subdue and have dominion (see *Genesis*, 1:28, 9:1).

I do not anticipate that *homo custodians* will differ from us physically to the extent, for instance, that we differ from our Neanderthal forerunners. The evolutionary leap before us is a mental/emotional one. The new human species will *feel* as integral to the whole planet as the most sensitive of Native American populations have felt to their local environments. *Homo custodians* will assert an unequivocal "yes" to what Einstein called the most important question: "Is the universe friendly?" To answer otherwise, with cosmic powers at our disposal, is to be inclined toward ending the whole business.

Homo sapiens does not have the sensitivity and receptivity required for planetary custodianship. Species-wide individual and corporate awareness of the long-distant, long-time consequences of local acts requires communication skills more comparable to planetary telepathy than to planetary telegraphy. Fortunately, planetary telepathy is precisely the evolutionary leap for which our electronically ´wired´ planet is now selecting.

Fitness to survive in an electronic information environment, which functions at or near the speed of light, is a function of one´s ability to send and receive information rapidly, accurately, and honestly. What little is known about telepathy suggests that a telepathic species would have excellent adaptability in an electronic information environment. How better to sense the effects everywhere of one´s acts anywhere, and thus be capable of thinking like a planet?

John Haught demonstrates in The Cosmic Adventure that science does not necessarily preclude the religious intuition "that the universe is at heart, in its transcendent depths, a graceful, caring, enlivening environment," an environment that is "trustworthy and fulfilling rather than indifferent or hostile toward us." The best that homo sapiens can do is to believe that this is so while minimizing behaviors and actions that seemingly make it otherwise, and to gladly welcome the successor species that embodies its being so.

How will we recognize homo custodians? Look for those who consistently feel with their minds, think with their hearts, and generate harmonious consequences with modest efforts.

REFERENCES

John Haught, The Cosmic Adventure: Ramsey, NJ: Paulist Press, 1984, pp. 2-3.

III. I. The Need for a Philosophical Foundation for the Teaching of Science

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Introduction

On the eve of the 21st century, our civilization finds itself in possession of weapons that potentially could end the human race. Yet, as Barrett (1962, p. 3) comments:

> We do not ask ourselves what the ultimate ideas behind our civilization are that have brought us to this danger. We do not search for the human face behind the bewildering array of instruments that man has forged; in a word, we do not dare to be philosophical.

Instead, we pursue more science to develop more technology, hoping we will become more rational and ultimately erase the anxiety and panic over the future of our existence. We insist that our children do the same.

The suggested educational changes in elementary and secondary schools around the world are favoring more science in the curriculum. The basis for this movement seems to center around three main goals:

1. to help individuals be more rational and autonomous
2. to develop an individual's ability to knowledgeably participate in a technological society
3. to develop in individuals science concepts and skills as the basis for functioning successfully in everyday life.

These are noble goals, but are we to believe that learning about cell structure, tree ring growth, mitosis, meiosis, gravity, and particle collision can develop more rational, moral, and concerned citizens who will understand their relationship to the rest of society and the environment? Can learning about science give science and technology a human face or identity? Or are we simply, with our present science curriculum structure of process and content, advancing the image of man as "homo faber"--technological man (Barrett, 1962)?

Science in the Context of Society

In order to provide some answers to these questions, we need to examine what has shaped our present views of science both as a discipline and in relationship to man.

To do so requires us to look at three seemingly separate disciplines; theology, philosophy, and science, and their interrelationships. What all three disciplines have in common is that they each offer a way of looking at or analyzing man's existence. Theologians pursue man's relationship to God, with faith at the center of all understanding. Philosophy, on the other hand, ignores dogma and deals with physical and metaphysical speculations. The development of the scientific method by Descartes in the 17th century and the increased organization of facts or data pushed philosophy solely into the area of metaphysical speculation (Barrett, 1962). The exploration of physical reality was put into the hands of science.

Descartes, considered the founder of modern philosophy, provided a philosophical basis for science which was strongly tied to theology. He viewed the physical world as mechanistic and entirely divorced from the mind, the only connection between the two being by intervention of God. An example of this philosophy in practice can be illustrated in Newton's 17th century description of the laws of gravity. Newton stated that initially the planets had been hurled by the hand of God and what happened since was accounted for by the laws of gravitation (White, 1960). Religion, therefore, was the uncontested center and ruler of man's life which provided him with a haven for his doubts (Barrett, 1962).

Since nature was considered one of God's creations, it was held in respect by man. It was not that man had not exploited nature, but his power to dominate it was limited by the technology available to him. Until the 17th century there was no need for an explicit ideology to justify the damage done (Toffler, 1982). The Industrial Revolution and the problems of rapid urbanization were to test the idea of man living in harmony with nature.

Thomas Malthus, an English economist and sociologist, provided an ideological framework which would change the benevolent and harmonious relationships between man and nature to one of conflict and struggle. His principle of populations stated that unchecked populations increase geometrically, while at most the food supply can only increase arithmetically (Young, 1969). Hence, there existed an imbalance between nature's supply of sustenance and man's need for food. Malthus then suggested that individual struggle was necessary against the malevolent forces of nature. Poverty, which was an inevitable by-product of that struggle, simply represented a sacrifice in individuals for the progress of the nation (Palmer and Colton, 1965).

This legitimization of the idea of a law of struggle provided Darwin with the theory which would explain the preservation of favored species and the destruction of unfavored ones. Although Darwin's theories were chiefly concerned with biological evolution, his ideas linked nature and evolution through the principle of progress--the idea that history flows irreversibly towards a better life for humanity (Toffler, 1982).

The consequence of this is that scientific reason now provided man with no technical or moral limits to his industrial conquest of nature (Barrett, 1962). No moral limits because science assured us, with its powerful reasoning tools, that it could only make our lives better. The popular philosophy of the 18th and 19th century became known as positivism, and later in the 20th century as logical positivism. The foundation of both philosophies was based on scientific reason. Positivism maintained that the goal of knowledge was not to explain, but simply to describe the phenomenon experienced. Rational man, equipped with the scientific method, rather than metaphysical God, became the new focus of worship (Barrett, 1962).

Science in the Context of Education

Object or objective teaching, as proposed by Pestalozzi in the late 1850's reflected the positivist philosophy with its emphasis on description rather than interpretation. Object teaching was highly formal in structure and did not acknowledge the reasoning ability and hence the interpretive capabilities of children (Smith, 1963). An aspect of object teaching which has been neglected, however, is that this method did propose the first integrated approach to learning: by examining an object, children could cultivate skills in drawing, writing, geometry, reading, spelling, geography, and natural history.

Subsequent teaching methods, such as nature study and the heuristic approach, (which advocated that students not be told the outcome of experiments, but rather find out for themselves), arose in response to limited and localized interest in science and education but failed to provide an unified methodology or philosophy.

John Dewey has been credited with providing education with a consistent, workable philosophy. He suggested that truth is based on experience which could be tested, and truth, which is evolutionary in nature, has no link with metaphysical reality. In elementary science education this translated into the inquiry method, and eventually the "science as process" method of teaching. Here the methodology of science was at least, if not greater in importance, than the actual knowledge accumulated and students were taught science through observing, experimenting and problem-solving (Smith, 1963).

An important, but consistently overlooked, tenet of Dewey's philosophy was his belief that education could be used to develop individual, interpersonal, and social attitudes, as well as skills (Fullan, 1982). Dewey also suggested that all those who are affected by the educational process (aside from principals, teachers, and students), such as parents and community groups, should also become a part of the educational enterprise (Sarason, 1982).

The dark side of Dewey's philosophy is that he placed so much emphasis on the scientific method to explain or rationalize human behavior and interaction. He, like many of the other philosophers of the time, made the assumption that the laws which govern behavior and society operated on the same level as those which could explain apples dropping from trees or the collision of atoms.

We insist in the 20th century in applying this same philosophy, that all truth is testable, for example, when we attempt to measure an abstract idea such as attitude. Using the Science Teaching Attitude Scale (STAS), Piper's Attitude Toward Science Scale (PATSS), or Bratt Attitude Test, numbers are generated from individual, controlled, responses and then translated through the power of statistics into attitudes. Each testing method begins with a series of assumptions which are not tested, yet become an important part of the formula. Ironically, one ends up with a test for attitude which in inherently biased by an imposed set of assumptions, or "attitudes".

The reality of education in the industrial age, whether in science or any other discipline, followed the factory model of mass production rather than the enlightened goals of Dewey (Toffler, 1982). Toffler in the Third Wave (1982) suggests that mass education resulted in two curricula, one "overt" and the other "covert." The former curriculum taught the basic reading, writing, and arithmetic, while the covert curriculum taught more basic courses: one in punctuality, one in obedience, and one in rote, repetitive work.

Have 20th century curricula deviated from this formula? Not according to recent unpublished work by Morrisey and Bell (1985). Their findings report that 53.9 percent of the time spent in a typical elementary classroom is spent on reading and writing skill. Perhaps not too surprising, 21.2 percent of the time was spent managing the classroom, i.e., opening exercises, housekeeping, discipline, and transitions. The balance of classroom time is spent on physical education - 7.4 percent, mathematics - 6.9 percent, field trips, which include social studies - 4.1 percent, and science - 0.5 percent. There was no time spent on art and music.

Science in a Future Context

It would appear from this research that very little has changed in education over the last one hundred years. The question which immediately comes to mind is why? Why, despite the contribution of Piaget on learning theory, do we insist on overteaching, drilling and rote memory? Why, despite attempts since 1978 to teach to the affective side of children we primarily teach to the cognitive side? Why, despite the post-Sputnik science program of 25 years ago, science still remains one of the least taught subjects in elementary schools? Has learning about science, however limited, created a citizenry concerned and galvanized on human and environmental issues? Perhaps not.

Learning about science has focused on the methodology of science (process) and the product of science (content), with little emphasis on its context. Streng (1976, pg. 16) has indicated the consequence of this approach.

> With the coming of technology and the rapid expansion of knowledge, it may be that knowledge for its own sake seemed all-important as the key to progress. At a certain level of technology, knowledge outgrew the capacity of individuals to absorb it. Specialization proliferated. Then came a phase of trying to build the skills to produce more knowledge ("process"), with concentration on methodology rather than meaning. In all this absorbing concern with knowledge and skills there came depersonalization. Self-knowledge was lacking, somehow, and various groups in an expanding population also became alienated from each other.

Without an ideology or philosophy which embraces individual worth and society, learning about science and education will continue to follow the factory model of mass production. Streng (1976, pg. 17) goes on to suggest:

> The elementary science educator must look beyond details of technology and check-lists of competencies to children and their attitudes and values for the world.

The starting point for changing our views of science and education is by building an educational philosophy which has as one of its components, rather than as its prime tenet, scientific methodology that all truth is knowable and testable. The basis for this philosophy would not be science, mathematics, reading, technology, progress, teachers, students or school boards, but rather the integration of knowledge and its application to society. Furthermore, Toffler (1982, pg. 370) proposes:

> At the same time much could be done by the schools themselves to create a sense of belonging. Instead of grading students purely on individual performance, some part of each student's grade could be made dependent on the performance of the class as a whole or some team within it. This would give early and overt support to the idea that each of us has responsibility for other.

Our present view of society and the environment is shaped very strongly by the positivist philosophy and Malthusian ideal that all truth is knowable and testable, and that progress is by its nature benevolent. We can no longer afford to think in these terms because we now realize that natural resources are finite and we cannot sacrifice individuals for the good of the whole.

But it is difficult to suspend our preconceived notions and beliefs of what is or what should be. To change the way a teacher feels about his or her students, education, school, or science is to suggest that they change their philosophy.

Sarason (1982) notes that instead of looking to our values and assumptions as the area for change, we change what is easiest--the engineering aspects. We commission new books; add new and more specialists, programs and curricula and we hold more meetings.

Let us temporarily put on hold these technical aspects of change and begin to integrate the knowledge we have accumulated. A sustainable future must rely on a sound, workable, philosophical foundation.

REFERENCES

Barrett, W. Irrational Man: A Study in Existential Philosophy. New York: Doubleday, 1962.

Fullan, M. The Meaning of Educational Change. Toronto: OISE Press, 1982.

Morrisey, J.T. and J. Bell, Results of Time-on-Task Study in New Brunswick Elementary School Classrooms. Unpublished results, University of New Brunswick, 1985.

Palmer, R.R. and J. Colton, A History of the Modern World. New York: Alfred A. Knopf, 1965.

Sarason, S.S. The Culture of the School and the Problem of Change. Second Edition, Boston: Allyn and Bacon, 1982.

Streng, E. The Mission of Science Education: The Elementary School. In W. Capie and F.W. Fox (Eds.) 1976 AETS Yearbook: Reflection in Science Education. Columbus, Ohio: Ohio State University, 1975.

Toffler, A. The Third Wave. Toronto: Bantam, 1981.

White, A.D. A History of the Warfare of Science with Theology in Christendom: Volume 1. New York: Dover, 1960.

Young, R. *Malthus and the Evolutionist: The Common Context of Biological and Social Theory*. Journal of Historical Studies. 1969, No. 43, 109-145.

III. J. Reflections on James Watt: Towards an Understanding of the Philosophical Underpinnings of the Anti-Conservationist Disposition Found in the U.S.A.

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The word "conservative" finds its root in the Latin verb *conservare*, which means to keep or preserve. This being the case, it is difficult to ascertain just how the current administration of Ronald Reagan can truly be labeled conservative when it comes to questions of the environment. More specifically, James Watt, ex-Secretary of the Interior, vividly demonstrated during his two and one-half years in office a keen desire to exploit rather than preserve this nation's wilderness areas. Mr. Watt may have claimed to be a conservative, but he was decidedly not a conservationist. What Mr. Watt was preserving was a line of political, social, and economic thought that developed out of the 17th and 18th centuries. In fact, his personal political orientation is a product of this philosophical tradition in the extreme. If we are to adequately understand ex-Secretary Watt and the anti-conservationist disposition which exists in many segments of our society, we must also understand that tradition which has shaped them. This is the intent of this paper.

* * * * * *

By the time of his death in 1727, Sir Isaac Newton had radically altered man's concept of the universe. By discovering a mathematical method for describing physical motion, Newton attempted to subject all the diverse phenomena of nature to the laws of mathematics. What had heretofore been seen as random, chaotic, and unknowable was, for Newton, an illusion. The seeming complexity of unrelated objects and events could in reality be reduced to a few simple laws. Hence, whether describing the motion of planets or the manner in which a snowflake falls from the sky, Newtonian mechanics offered a well-ordered explanation.

Not wishing to digress into a detailed capitulation of Newton's laws, let it merely be noted here that his mechanical paradigm proved to be compelling. It was comprehensible, predictable and, best of all, workable. It not only explained how the universe worked, but it demonstrated that there was indeed an order to things, and that this order could be found out through scientific observation and mathematical formulation. In short, the world and how it operated was no longer unknowable. Fate was replaced by formula.

Having once assigned order to the physical world, the problem which came to concern many 17th century scholars was the lack of discernable order in human affairs. In light of a well-structured universe based on ascertainable laws of nature, how could one explain the chaos which clearly permeates the political, social, and economic institutions of a peopled world? The unpredictable behavior of people, the imperfect workings of economics and governments that were subject to the whims of princes, simply did not coincide with the scientific explanations offered by Newton. This disparity became the preoccupation of men who set out to prove that human events, as well as physical events, could be reduced to a few knowable laws.

Two men that were to have a profound effect upon the Founding Fathers of the American Nation were John Locke and Adam Smith. In a sense, both were the intellectual heirs of Newton, and so it was not surprising that they set out to reconcile Newton's ordered universe with the irrational and unpredictable human element.

Locke and Smith proceeded on the assumption that if the peopled world was chaotic, then it was chaotic because it was not conforming to the natural laws that governed the universe. What was needed was to ascertain how natural laws applied to human beings and their institutions and then to reconcile the disparity between the two. Thus, it was John Locke who attempted to bring the functioning of government and society into line with the Newtonian world view. Adam Smith attempted the same with economic affairs.

For John Locke, individual self-interest was the principal justification for the establishment of the state. More specifically, Locke reasoned that people bind themselves together for the purpose of protecting their property. In the Second Treatise of Civil Government, he writes, "The great and chief end, therefore, of men's uniting into commonwealths and putting themselves under government is the preservation of their property."[1] Thus, for Locke, in an enlightened society, people could mix their labor with their property to produce wealth without fear of that wealth being unjustly confiscated by another.

Locke's preoccupation with the protection of individual wealth was a timely concern because the scientific methodology introduced by Newton was to prove to be a potent tool for the creation of a rapidly expanding technology. So rapid, indeed, was this expansion when compared to the incremental progression in man's understanding of nature prior to this time, it could not but be supposed that at last man had discovered the means by which he could fully subjugate nature to his will. What Locke did was define the proper role of government in light of an emerging world view which promised to provide material prosperity for all. Hence, Locke was instrumental in establishing a line of thought that has dominated much of the Western World to the present: The social role of government is to promote the subjugation of nature so that individuals may acquire material prosperity. Thus, in describing Locke's particular philosophy, Leo Strauss writes that, "The negation of nature is the way toward happiness."[2]

That Locke intended for nature to be fully exploited is clearly illustrated by his attitude toward the proper utilization of land. To Locke, "land that is left wholly to nature...is called, as indeed it is, 'waste'." He goes on to state that the benefit of such "waste" will "amount to little more than nothing."[3] Thus, nature has value only when it is exploited. "It is labor, then, which puts the greatest part of the value upon land, without which it would scarcely by worth anything."[4] Needless to say, modern-day environmentalists would not agree.

But Locke does not stop here. In fact, he goes on to declare that individuals have a duty to accumulate as much as possible. "He who appropriates land by his labor, does not lessen but increases the common stock of mankind."[5] Thus, for Locke, little fundamental conflict exists between self-interest and societal interest; that which benefits the individual (i.e. the accumulation and exploitation of land) will automatically benefit society. Furthermore, since people are naturally acquisitive and as long as they continue to increase their personal wealth, social well-being and harmony must continue to improve. Thus, in Locke we have not only one of the original proponents of the "trickle-down theory" (the more the individual accumulates the more society will benefit), but we also find expression being given to the idea of unlimited expansion.

Adam Smith, like Locke, was greatly influenced by the Newtonian world view and sought to find those universal laws which underpinned economic affairs. He assumed that once these laws were known, and socio-economic affairs adjusted accordingly, then economic growth and prosperity would result.

The parallel between the perceptions of Locke and Smith in terms of the fundamental nature of man is indeed striking. Even more than Locke, Smith believes that humans are self-aggrandizing; in fact, he seems to indicate that the basis of all human activity is material self-interest. This, however, is not necessarily to be deplored, since it is only natural. As a consequence, government should in no way erect barriers to prevent individual acquisition of wealth. The most practical form of economic organization is laissez faire--leaving people unfettered in their economic pursuits. By leaving people free to pursue their natural tendency towards self-aggrandizement, society cannot but be benefited. People acting selfishly will overcome scarcity by creating surplus, which itself will lead to an increased societal wealth. As Smith writes:

> Every individual is continually exerting himself to find out the most advantageous employment for whatever capital he can command. It is his own advantage, indeed, and not that of society which he has in view. But the study of his own advantage naturally, or rather necessarily, leads him to prefer that employment which is most advantageous to the society.[6]

Once again, we are assured that whatever benefits the individual will of necessity benefit society.

Just as Locke made the consideration of moral questions pertaining to social relations an inappropriate concern of the social scientist, Smith did the same with economics. Should government attempt to interject morality into economic affairs, this would constitute a violation of natural law. If natural laws are adhered to, economic growth will result. However, if government interferes with the "invisible hand" (the natural law which automatically regulates the production and distribution of goods, as well as labor and capital) the economy will cease to function in an efficient manner. Thus, just as people cannot control Newtonian laws, they cannot improve on the perfect functioning of the "invisible hand" in the market place. The point was to provide the kind of socio-economic atmosphere which would facilitate the unfettered operation of these laws.

Let us now turn our attention away from the past and focus on the present. There can be little doubt that the ideas of Locke and Smith have had a profound effect on the current administration of Ronald Reagan. Indeed, the President's supply-side economic policies and pronouncements are a good deal more than mere rumblings of the distant past. More than lip service is being paid to the ideas derived from these two apostles of old.

Exemplifying these ideas par excellence is James Watt, Ronald Reagan's ex-Secretary of the Interior. Conservationist organizations and environmentalists in general were rightly alarmed by Mr. Watt's vigorous campaign to open lands that had previously been protected from development by petroleum and mineral companies.

In his two and one-half years in office, Watt was able to use administrative budget cuts go purge the Department of the Interior of individuals holding political and economic philosophies incompatible with his own. Simultaneously, he revamped federal leasing and permit procedures in an attempt to reduce regulations that had restricted drilling and mining activities in locations that had previously been designated as wilderness areas.

One of the first results of these more lax regulations manifested itself in the environmental impact statement. According to Robert Burford, Director of the Bureau of Land Management, "We have...reduced the cost of preparing an environmental impact statement from $6,000,000 to $60,000 and cut the time required in half."[7] Whereas most conservationists would agree that federal environmental studies had become long and expensive, they now have good reason to believe that the pendulum has swung too far in the other direction. Under Secretary Watt, for example, an exploration lease was granted in an Arkansas wilderness area with only a three-page environmental assessment. Also, without public notification, Mr. Watt granted permission for slant drilling under the Capitan Wilderness Area in New Mexico.

Watt's anti-conservationist disposition is best illustrated by what has come to be known as "the great giveaway." Before being stalled by Congress and the courts, Watt had planned to lease as much as 16 billion tons of coal at a fraction of its real value. He had hoped to do this with little or no environmental review. As there were already 18 billion tons of federal coal under lease, less than 20 percent of which are in production, it is difficult to understand Watt's motivation. Indeed, at a current rate of use, that coal already leased represents a 180-year supply.

Perhaps the clearest view of Watt's ideological orientation is offered by the ex-Secretary himself. Watt once took a tour of a remote mountain region within a state park system. After some time, he asked his escort why the large stands of timber weren't being cut and why the lush meadows weren't being grazed. Watt's host remembers, "I got the feeling that he (Watt) didn't understand the purpose of parks." Like Locke, Watt too was concerned with "waste".

In the form of a brief conclusion, two points need to be made. first, it should be noted that most U.S. citizens tend to subscribe to the basic views and beliefs espoused by Locke and Smith. This should come as no surprise, for indeed most of us have undergone a rather similar indoctrination. Or, to put the same proposition in a slightly different perspective--our economic and political socialization as members of the same nation state has imbued us with values common to the whole. As a result, even the most ardent environmentalist will generally support Locke's respect for the sanctity of private property and Smith's belief in laissez faire. Hence, whatever differences exist between James Watt and most conservationists are generally a matter of degree and not of kind. That is precisely why I started this paper by asserting that Watt is the product of a "philosophical tradition in the extreme." Where many would draw lines as to just how much of Locke and Smith's philosophy is desirable, Watt seems not to do so.

This, then, brings me to my second point. Times have changed radically since Locke and Smith, and many of the conditions upon which they based their premises have also changed. Does it then not follow that what was valid under certain conditions may not be valid under altered conditions?

Locke, for example, lived in an England that predated the Industrial Revolution. In an agrarian land that had not yet experienced a burgeoning population, Locke was able to state that men had a right to own that land which they worked and that, since more than enough land was available, conflict between individuals would not arise.[8]

Clearly, Locke did not anticipate the impact of the Industrial Revolution. That mechanization would many times over increase the land area that an individual could work was simply unforeseeable. Thus, the idea that one had a right to own that which he worked and that there was plenty for all was greatly altered by mechanization and an expanding population. Similarly, Adam Smith had no way of predicting the tremendously elevated energy consumption patterns of this century. He could not have known that a few large, and I might add non-competitive, corporations would come to control the energy life-blood of entire nations of people. He could not have known of the complex international relationships that would develop around energy sources not known or utilized in his day and he, therefore, could not have imagined the suffering that could potentially occur if governments did not attempt, at least to some degree, to control pricing and equitable distribution. Nor could Smith or Locke have understood the extent to which 20th century man could mercilessly exploit nature.

We, in this country, own a tremendous debt to both Locke and Smith. Indeed, the very idea of limited government, much of our prosperity, and many of our most cherished rights can be traced directly to their influence. Much of what they wrote is as valid today as when they were living. This, however, does not negate the fact that time and circumstances may have undercut the validity of some of their observations. Hence, there is a need to constantly reevaluate the philosophical underpinnings upon which we base our actions. It is here that ex-Secretary Watt failed, for he proceeded as though nothing has changed in the past three hundred years.

ENDNOTES

[1] John Locke, "The Second Treatise of Civil Government," in *John Locke: Two Treatises of Government*, ed. by Thomas C. Cook (New York: Hafner Press, 1973), p. 184.

[2] Leo Strauss, *National Rights and History* (Chicago: University of Chicago Press, 1953), pp. 250-51.

[3] Locke, *op. cit.*, p. 142.

[4] *Ibid*.

[5] Locke, *op. cit.*, p. 139.

[6] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. by Edwin Cannon (London: Mithuen, 1961), 1:475.

[7] As reported in *The Christian Science Monitor*, December 8, 1981, p. 3.

[8] Locke, *op. cit.*, p. 138.

III. K. Theological Approaches to Environmental Education

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Introduction

Experts almost universally describe environmental education (EE) as an undertaking which involves the examination and understanding of many disciplines and cultural factors. Yet, the vast majority of our EE curriculum materials and programs fail to address what may be the root cause of environmental woes--the human spirit. Professor Richard Baer of Cornell University has written that:

> ...until we recognize that man's spirit itself is the ultimate front line of the environmental crisis, we will continue to nibble away at the edges. (Baer, 1974)

Subscribing to Baer's philosophy leads one to wonder how religion can assist with the resolution of environmental problems and in the planning and conduction of EE programs. The central focus of this presentation is on Christianity's potential for aiding EE.

Christianity and EE

Although it has been little utilized, a Christian theological approach to EE has tremendous potential for enhancing environmental concern and appreciation: it presents a clear and very powerful basis for environmental concern; the concepts already exist in the belief systems of many people and need only to be pointed out; the number of receptive people is very large; and communication and organizational networks are already in place.

Review of Christian theology reveals three main themes which obligate followers to practice environmental conservation/preservation. Old and New Testament biblical teachings clearly indicate that:

1. God is sovereign creator and savior of both humankind and creation.
2. God's plan is for unity between himself, humankind, and nature (creation).
3. Humans have been given dominion over nature, along with the responsibility for good stewardship of it.

Thus, properly defined and practiced, Christianity charges humans "to preserve, enhance, and glorify the creation, and in so doing, to glorify the Creator." (Wilkinson, 1981, p. 224)

The Church, as the voice of Christianity, may be uniquely suited to assist EE on a global scale because of its "focus" and "wherewithal." Charged with bringing the teachings of Christ to all humans, the Church already has a global focus to its ministry. With a membership of approximately 999,000,000 representing every continent, the Church has a novel and world-wide influence (focus) among human institutions. No other institution reaches as many people, in their native language, as does the Christian Church. Focus of this magnitude seems necessary to confront the global dimensions of current and future environmental problems.

The Church also possesses the wherewithal to implement programs advocating environmental protection and lifestyles which contribute to a sustainable future. It has demonstrated, through voluntary donations of its members, the ability to erect awesome structures of ornate beauty, collect great art treasures, and financially support missionary programs throughout the world. It is efficiently active in publication of print and non-print media. In short, the Church has the focus and wherewithal to aid, as stated by Lynton Caldwell, in "internalizing an ecological conscience in a critical mass of mankind." (Caldwell, 1980, p. xiii) There are, however, obstacles to accomplishment of these potentialities.

Obstacles to Incorporating Christian Belief with EE

Hindrances to incorporating Christian belief with EE can come from many quarters, including the educator, the educational institution, and the participants. Obviously, an educator unaware of religious aspects or one who does not believe them cannot present them effectively. But even prepared and eager interpreters may encounter problems before sharing their messages.

Many institutions have policies prohibiting religious programs. For some, it is because of official regulations. For example, "separation of church and state" would not allow government services to offer such programs. Other institutions fear that "sectarian" programs would offend some factions of the public and so decrease the breadth of their support. Yet another obstruction can come from funding organizations which stipulate that their grants not be used for religious programs.

Participants' expectations and prejudices sometimes constitute other obstacles. People attending church camps or retreats may be prepared for recreation rather than programs containing messages. And many Christians, especially conservatives, look askance at anything smacking of "science," which they associate with humanism. Another belief is that everything not directly related to evangelism detracts from that primary task.

Strategies for Incorporating Christian Belief with EE

Many compatible concepts and strategies allying Christian belief and EE exist. Three are particularly useful: (1) the environment is God's creation; (2) humankind has been given stewardship responsibilities; and (3) parallel concepts which can be used as analogies.

To utilize these strategies, many "old standby" activities can be used with little or no modification. A brief introduction or a verse from the Bible can transform an interpretive experience from a casual encounter with nature into a powerful spiritual message. At the same time, new activities with these specific emphases need to be developed. Strategies for blending Christian ideas into environmental education programs, together with examples, are described below.

1. The environment is God's creation (Genesis 1:1; Psalms 8:3, 24: 1-2, 136; 4-9, and 104; Isaiah 42:5, 44:24,

45:12, and 45:18; Nehemiah 9:6; Colossians 1:16; and Hebrews 1:2). Not only that, but He owns it (Deuteronomy 10:14; Leviticus 25:23; Exodus 19:5; 1 Chronicles 29:11; and Psalms 89:11). These insights can enhance respect for anything being interpreted. A "Why in Creation" talk spotlighting the natural history of selected organisms can engender wonder and admiration, if not fondness, for even mosquitoes and poison oak.

2. Humankind has been given stewardship responsibilities. (Genesis 1:26-28; Psalms 8; 6-8) Although some have argued that humanity has been given license to exploit, specific commandments concerning trees and cultivation practices (Leviticus 25:3-5; Exodus 23: 10-11; and Deuteronomy 20:19) indicate that this is not the intention. The model for proper stewardship is Jesus, the Lord who serves.

   An illustration of this approach is a guided fantasy in which the participants are invited to imagine themselves given the task of guardian over a wondrously prepared and priceless terrarium. Then it is pointed out that the earth is immensely more glorious that any terrarium, and that we have indeed been given just that task.

3. Parallel concepts in ecology and theology can be used as analogies. Indeed, many of Jesus' parables draw on this strategy. Not only can understanding of nature aid learning about spiritual matters, but the reverse is also true. There are several excellent parallels, some of which are outlined below.

   - Interrelationships. Natural communities are vast webs of independent relationships, and Christians are called to have fellowship and love one another (John 13:34; 17:20-21; Acts 2:42; Romans 12:10; 1 Thessalonians 4:9; and Hebrews 10:24-25).

   - Communities. In illustrating the fact that in the church all members are necessary and are built together for the common good, Paul uses the illustration of the human body (1 Corinthians 12:12-13). He could have used a biotic community instead.

   - Differences are essential. Spiritual gifts differ (1 Corinthians 12:4; Ephesians 4:7-16) and all work together for building up the church, and diversity within a biotic community is necessary for the health of that community.

   - Death is necessary for life. To enter the kingdom of God, we must be born anew and the old self must die

(John 3:5; Romans 6:2-11) and death and decomposition are necessary for the recycling of nutrients.

Although some of these connections between spiritual truths and environmental phenomena were used nearly two thousand years ago by no less a teacher than Jesus of Nazareth, they are rarely seen today in the field of environmental education. There are, however, encouraging signs that their use is increasing.

Overview of Current Christian Approaches to EE

Five categories, as follows, may encompass current Christian approaches to EE:

1. Utilization of Print Materials
2. Utilization of Non-Print Materials
3. Thematic Events
4. Ongoing Church Education Programs
5. Conventional EE Programs

Use of the printed word to foster EE is increasingly evident today if one examines Christian literature. As evidenced in the references section of this paper, more and more Church publishing houses (church-financed publishing companies) are producing written materials related to the environment. Sunday worship bulletins expounding Christian responsibility for stewardship of the earth are frequently used by many denominations. Curriculum resources focusing on Christian EE are also becoming increasingly available.

Non-print materials are noticeably less available than the printed types discussed above. Some films and filmstrips portraying Christian approaches to EE do exist. Many of them deal with world hunger.

Thematic events focusing on environmental topics vary from one-day Sunday worship events such as "Rural Life Sunday" to more involved EE undertakings. Church environmental conferences, seminars, and workshops have provided instruction on topics such as world hunger, conservation of/and alternative energies, life styles, nuclear energy, acid rain, land stewardship, population, and various other themes.

Examples of on-going Church EE projects include the Church's Acid Rain Project and the Eco-Justice Working Group. The purpose of the interdenominational Acid Rain task force is to educate church members about acid rain and help them fulfill their role as citizens by taking effective action. The task force works with regional and state church agencies and secular groups such as the National Clean Air Coalition. An Acid Rain Resource Packet has been prepared to help local church groups get started. The packet consists "of facts on acid rain, a legislative update, helpful questions and answers, workshop and Christian education materials." (Hundertmark, 1985, p. 100)

An Eco-Justice Working Group has been created by the National Council of Churches. The group consists of representatives from several church denominations who work with non-church organizations to educate citizens in the area of clean air (including acid rain), toxic wastes, and energy issues.

Christian camping programs appear to be primary avenues for Church EE. Most denominations have some type of camping opportunity for their membership whether facilities are church-owned or leased. The extensiveness of church camping can be grasped if one examines an association called "Christian Camping International" (CCI), which includes nearly 4,000 members from the U.S., Canada, and 46 other nations. Literature and curriculum materials published by CCI and various church publishing houses suggest that EE is taking place in many ways through Christian camping.

Not only are churches paying closer attention to theological approaches to EE, but so are some non-formal educational institutions. For example, the Sacramento Science Center and Junior Museum offers tours, animal presentations, and outreach programs especially designed for Christian school groups and other parties of similar persuasion.

Conclusion

Aldo Leopold wrote in 1949 (A Sand County Almanac) that conservation education would not be a success until a "land ethic" permeated society. He argued that:

> Individual thinkers since the days of Ezekiel and Isaiah have asserted that the despoliation of land is not only inexpedient but wrong. Society, however, has not yet affirmed their belief. I regard the present conservation movement as the embryo of such an affirmation... The proof that conservation has not yet touched these foundations of conduct lies in the fact that philosophy and religion have not yet heard of it (Leopold, 1949, pp. 203 & 210).

Considered by many to be the deceased patriarch of the present environmental movement, Leopold would be pleased to know that philosophy and religion have now indeed heard of conservation (and the need for a land ethic) and are beginning to actively call for societal acceptance. While adulthood has not been attained, the conservation/environmental movement has grown well beyond the embryonic stage, with great promise existing for its continued maturation.

Christian leaders must examine the central tenets of their religious heritage and step boldly forth as modern-day Isaiahs, proclaiming the biblical vision of faithful stewardship of God's earth. Actually they are called to go a step further than proclamations and become contemporary Noahs who incorporate earth building actions with their words!

Finally, all environmental educators may wish to consider the implications of Benjamin Franklin's action at the first Constitutional Convention. After the convention had failed for four weeks to write one word of a constitution, Franklin addressed George Washington saying:

> I have lived, sir, a long time; and the longer I live, the more convincing proofs I see of this truth, that God governs in the affairs of men..., Without his concurring aid, we shall succeed in this political building no better than the builders of Babel; we shall be divided by our little partial, local interest, our projects will be confounded... I therefore beg leave to move, that henceforth prayers, imploring the assistance of Heaven and its blessing on our deliberations, be held in this assembly every morning. (Jones, 1946, p. 225)

Soon after implementing Franklin's suggestion, progress began to occur and the Constitution became a reality. Many have since considered the Constitution to be one of the most remarkable works of human intellect. Did prayer turn the tide in 1787? Have we environmental educators implemented all of our resources in trying to make "progress toward a sustainable future?"

REFERENCES

Baer, Richard A. Jr. "Religion and the Environment." Environmental Attitudes, Ethics, Values, and their Communication. Proceedings, 21st National Conservation Education Association Conference. 1974.

Barnett, Timothy L. and Flora, Steven R. Christian Outdoor Education. Duluth, Minnesota: Camping Guideposts Publishing, 1982.

Berry, Wendall. The Gift of Good Land. San Francisco, California. North Point Press, 1981.

Blackburn, Anne M. (Ed) "One Effort to Improve Agricultural Practices in the U.S." Friends of UNEP. Wayland, Massachusetts, 1985.

Brueggman, Walter. The Land: Place as Gift, Promise and Challenge in Biblical Faith. Philadelphia: Fortress Press, 1977.

Caldwell, Lynton K. "An Environmental Agenda for the 1980's: Priority Admidst Diversity." Current Issues VI: The Yearbook of Environmental Studies. ERIC: Columbus, Ohio, 1980.

Cesaretti, C.A. and Commins, Stephen. Let the Earth Bless the Lord. New York: Seabury Press, 1981.

Dregni, Meredith Sommers. Experiencing More with Less. Scottdale, Pennsylvania: Herald Press, 1983.

Elsdon, Ronald. Bent World: A Christian Response to the Environmental Crisis. Downers Grove, Illinois: Intervarsity Press, 1981.

Gibson, William E. A Covenant Group for Lifestyle Assessment. New York: United Presbyterian Program Agency, 1981.

Granberg-Michaleson, Wesley. A Worldly Spirituality: The Call to Take Care of the Earth. New York: Harper and Row, 1984.

Hall, Douglas, John. The Steward: A Biblical Symbol Come of Age. New York: Friendship Press, 1982.

Hart, John. The Spirit of the Earth: A Theology of the Land. New York: Paulist Press, 1984.

Hessel, Dieter T. Energy Ethics: A Christian Response. New York: Friendship Press, 1979.

Hundertmark, Nadine. Pro-Earth. New York: Friendship Press, 1985.

Jegen, Mary Evelyn and Manno U. (Eds). The Earth is the Lord's. New York: Paulist Press.

Jones, E. Stanley. The Way. Nashville: Abingdon Press, 1974.

Joranson, Philip N. and Butigan, Ken. (Eds). Cry of the Environment. Santa Fe, New Mexico: Bear and Company, 1984.

Leopold, Aldo. A Sand County Almanac. New York: Oxford University Press, 1968.

National Council of the Churches of Christ in the USA. The Plutonium Economy. New York: National Council of Churches, 1975.

Shannon-Thornberry, Milo. The Alternate Celebrations Catalogue. Long Island City, New York: Pilgrim Press, 1982.

Shettel, Doris Lee. Life-Style Change for Children (and Intergenerational Groups). New York: United Presbyterian Program Agency, 1981.

Sider, Ronald J. (Ed). Living More Simply: Biblical Principles and Practical Models. Downers Grove, Illinois: Inter varsity Press, 1983.

Snyder, Howard A. Liberating the Church: The Ecology of Church and Kingdom. Downers Grove, Illinois: Inter varsity Press, 1983.

Squires, Edwin R. (Ed). The Environmental Crisis: The Ethical Dilemma. Mancelona, Michigan: Ausable Trails Institute of Environmental Studies, 1982.

Steck, Odil Hannes. World and Environment. Nashville: Abingdon, 1978.

Taylor, Richard. A Community of Stewards. Minneapolis, Minnesota: Augsburg Publishing, 1982.

Wilkson, Loren. Earth Keeping: Christian Stewardship of Natural Resources. Grand Rapids, Michigan: William B. Eerdmans Publishing Company, 1981.

Yaple, Charles H. "The Christian Church and Environmental Education: A Study of Involvements in the United States." Ph.D. Dissertation, Syracuse University, 1982.

Yoder, Robert A. Seeking First the Kingdom, Called to Faithful Stewardship. Scottdale, Pennsylvania: Herald Press, 1983.

III. L. Cultural Resources and a Sustainable Future

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Introduction

Although frequently considered as separate, cultural resources should be included as part of environmental resources. Cultural resources, which include archaeological sites, historic structures, and human-altered landscapes, are part of the physical environment and have properties similar to other so-called "natural" resources. They are both pollutable and temporally non-renewable, while being physically integrated into the larger environmental system.

Cultural resources can help achieve a sustainable future environment. That is, they can provide a future in which a society can pursue its cultural activities in a way that does not overload the regenerative powers of the environment (and therefore of the society). Cultural resources contribute in three ways: 1) they promote cultural identification with the environmental system by showing humans as part of a larger ecological complex; 2) they show the historic continuity of human-non-human interactions as part of a whole; and 3) they can demonstrate lessons about human-environmental interactions. The purpose here will be to discuss aspects of each of these.

Cultural Identification with the Environment

Cultural resources demonstrate that the relationship between humans and the environment is systemic. Cultural resources, as a physical structuring within the environment, also reveal how societies and their respective environments interact. No society exists independent of an environmental context; modern society cannot exist without modification and planned control of this context. Such control cannot be achieved without awareness of the consequences of human-environment interactions. Cultural resources provide historic documentation of those consequences.

Cultures that have a high level of environmental identification also have a steady relationship with the resources of the environment. This was characteristic of Europe during the centuries prior to the Medieval Industrial Revolution, before Augustinian Theology formally sanctioned a separation of humans and nature. This also appears to have been true of prehistoric groups in North America before the emergence of complex, stratified societies after 2000 B.C., as well as of the Inuit before the introduction of the rifle in the late nineteenth century.

Cultural resources in the eastern United States reveal the consequences of the failure to appreciate this systemic relationship. Examples range from the steadily decreasing size of logs used for cabin walls through extensive alluvial build-up in the floodplain of over-lumbered watersheds to the innumerable failed farms (represented now only by foundations and scattered fencelines) located in such abused landscapes.

Historic Continuity

Cultural resources show, through their historical character, that societies have been leaving a physical record in and on the environment for a long time. Every landscape is a cultural resource, and every landscape has a history. It may be no more dramatic than a line of wooden fence posts running through what is now a wetland (which reflects the consequences of the drought in the 1930's), but such resources reflect continuity as well as continuous change.

An understanding of the history of societal or cultural relationships with environments provides an understanding of present relationships. It also gives a temporal continuity for achieving a sustainable future relation with the environment. A society educated towards an understanding of the placement and continued existence of humans in the environment will promote a view of the environment that exceeds the mypoticism of immediate utilitarianism.

An excellent example of this is the tragedy on the Pine Ridge Indian Reservation in December, 1983, when the Lakota residents, housed in buildings derived from a New England maritime design, nearly froze to death because of the unsuitability of the housing design and the unseasonably cold weather. A question that should have been asked--and was not--was how people had managed to live in the area for thousands of years without having similar problems. In this case the cultural resources, in the form of the prehistoric archaeological sites in the area, reveal the continued use of earth lodges, which, when the physics of design are considered, prove not only thermally more efficient both in summer and winter, but substantially less expensive to construct.

Human-Environmental Interactions

Archaeological resources are in a unique position. Not only do they represent the history of humans in the environment, they also show the consequences of different cultural approaches to that environment. Studies of previous cultures contain lessons about how specific environments have been treated by past cultures and how the environments and cultures have fared as a result.

Archaeological research can tell us how concomitant is human manipulation of the environment. In other words, when cultures manipulate the environment, to what degree are they committed to maintaining their involvement to prevent degradation or catastrophe?

For example, New York State Route 12 between Lowville and Glenfield is set at the base of the Tug Hill Plateau, adjacent to the Black River floodplain. Immediately to the east the route is paralleled by what is now an abandoned railroad bed. The railroad was put through in 1869; the route was constructed in 1931. What has happened is that the railroad berm now serves as a check dam, creating marshy areas in what were once profitable crop and pasturelands east of the highway. Yet the hydrology is now so re-configured that removal of the rail bed causes rapid erosion as the intermittent streams cut their channels back to pre-railroad levels.

Conclusion

Education toward a sustainable future does not necessarily require cultural modification of society; rather, it requires an examination of the definitions used in our conceptualization of the relationship between people and the environment. One example of this is in the relationship between cultural and natural resources. We do not have to change our culture, we only need to adjust how we transmit it to our children. We have had the dialogue among our environmental professions; we only need to incorporate it into our educational system.

Cultural resources represent critical environmental resources. They provide one item actually absent from other kinds of resources considered: information storage. They are resources in the strictest sense, providing documentation of how other people, in the same areas we live in today, met the same kinds of problems we always face: adequate food and shelter.

III. M. Education for a Livable Future: The Philosophy of the Human Ecological Perspective John Visvader and Richard J. Borden, College of the Atlantic

Human ecology is a subject matter that is both very old and very new. It is new enough so that most people who hear of it are not exactly sure of what it is all about, and its general ideas are old enough and familiar enough so that once explained, it seems like common sense. Most simply put, it is the study of the relationship between human beings and nature. As such its subject matter must be as old as human culture itself, for the natural world is the stage upon which all human action takes place--it sets the basic problems of survival and tests the strategies that guide a variety of human behaviors. Without some knowledge of the workings of nature, and without some set of successful strategies for dealing with the natural world, no group of people can long survive. Thus the search for this kind of knowledge is as old as it is necessary. What makes this kind of study new enough to deserve a new name is due to several important factors, which include a growth in the complexity of the subject matter and new methods for studying complex systems.

The relationship between human beings and nature has become exceedingly complex, for several reasons. First of all, there are simply more people in the world and modern technology has amplified the impact of individual actions on the natural system. There are few parts of the world that are not drawn into the dynamics of human action. A second level of complexity involves changes in the nature and scope of human action itself. The patterns of modern life often disguise the long range or 'down stream' effects of our actions. For the simple hunter-gatherer who lives very close to nature, the effects of actions on the environment are relatively easy to discover. Everyone can see the effects caused by overhunting, and the strategies that guide the action of everyday life can be finely tuned to the requirements of survival and well-being. In our own lives the significance of our daily actions, in terms of their impact on the natural environment, is barely if at all visible. The choice of our laundry soap, hair spray, or vehicle of transportation is made for largely aesthetic or personal reasons, and has little reference to the effects on the larger community of which we are a part. If the complexity of our global interaction requires knowledge of general systems dynamics, the complexity of individual action in modern society needs to be augmented by knowledge that relates action to its chain of effects. Action which is opaque because of its remoteness from its effects needs to be made transparent.

The study of human ecology attempts to provide the information necessary for understanding the new complexities of the relationship between human beings and nature. It brings the findings of the new science of ecology to bear upon human affairs. In the old spirit of the scientific enterprise it pursues knowledge for its own sake, but it also illuminates the adequacy or inadequacy of human strategies and actions and becomes an adjunct to the universal search for wise and appropriate action.

When we speak of the human ecology perspective, we mean that perspective that views human beings and the natural environment as co-members of a dynamic and interactive global community. Considering our current awareness of all sorts of environmental problems this sounds like common sense, and may even be termed a vague and trivial generality. But if we scratch the surface of glib understanding we will find several misconceptions--perhaps we may call them myths--that mar the appreciation of this perspective.

A major misconception that enters into both sides of current environmental disputes involves a naive and romantic conception of nature. Nature is perceived as a realm in which harmony is achieved through various kinds of 'natural' and automatic mechanisms. Human harmony is achieved by working with nature and by not interfering with natural mechanisms. This idea has been very influential in the formation of our economic and political institutions. When the various thinkers of the Enlightenment period realized that human societies were part of nature and subject to the same natural laws, they proposed two models of human action based on different understandings of how to work with nature. One model suggested that human society ought to imitate nature by encouraging individual and spontaneous behavior. The apparently chaotic actions of individuals, each concerned with their own advantage, would be guided as if by 'an invisible hand' (in the words of Adam Smith) to produce a harmony greater than any that could be produced by action deliberately construed to produce harmony. This might be called the "myth of autonomous action". That it is a myth can be shown by a brief glance at history, for this model, in effect, allowed human beings to act without practical regard for the effects of their actions on either the social or natural communities of which they were members. Actions narrowly conceived still had effects which were far-reaching, and the natural and social worlds, left to fend for themselves, became far less than harmonious.

The second model of human action, which has become more influential today than at the time of its inception, holds that human harmony can best be achieved by leaving nature alone and interfering as little as possible with natural processes. Nature left to itself would establish a state of harmony through the natural mechanisms by which it works. Here, the complexities of an obtrusive civilization were responsible for the fall from natural harmony, and human beings were expected to live simple lives at the bosom of mother earth. This is the philosophy of primitivism expounded by Rousseau and others, wherein human harmony can be attained by studying and imitating the harmony of nature.

This misconception might be called the myth of "Nature knows best." That it is a myth can be shown by the findings of the science of ecology--for nature does not have any favored states, and ecosystems vary widely and replace each other with impunity. A desert is just as natural as a rain forest, though the one may be more favorable to human life than the other. The word harmony is an evaluative term and refers to human needs and desires. Nature, left to itself, doesn't automatically promote our advantage. The harmony we seek will neither be achieved through blind actions which supposedly imitate the actions of nature, nor will it be achieved by the pious worshiping of nature "in the raw".

The human ecology perspective tries to avoid both the myth of autonomous action and the myth of nature knows best. In its notion of community which includes both nature and human society, it views both poles of community as acting upon and changing the other. Rather than abandoning ourselves to the semi-divine guiding hand of nature, we must learn to use our own hands wisely.

If human ecology is to have an important and lasting impact it will not be because of some very novel conceptual breakthrough akin to the discoveries of molecular biology or quantum mechanics. Its major contribution is to human decision-making; it offers knowledge of complexly interacting systems so that human foresight can be exercised. It promotes the goal of graceful action through informed choices. It enters the moral realm not as a partisan of one position or another, but by exposing the long-range and downstream effects of action. This changes the significance of actions because I am responsible for what I do, and when I find that when, for example, I wash my clothes I may also be polluting my neighbor's drinking water or helping to bring about the extinction of a rare species of animal or plant, my action is put in a larger context which raises questions of a moral nature. The knowledge of natural systems when brought to bear on human action can't help but transform our understanding of those actions, and provides a different basis for their evaluation.

Seen in this light, a major importance of the human ecology perspective lies in its educative value. It teaches us something about the world and our actions that we did not know before. Its approach is interdisciplinary in the sense that it requires knowledge of both human systems and natural systems and their relationship. But we find that within traditional educational institutions there has developed a deep split between the study of natural systems and the study of human systems. This division between the sciences and the humanities seems so fundamental that we are often led to speak in a disparaging way about the existence of two cultures . But this division may be seen as an historical artifact that has outlived its usefulness.

If this division is to be overcome, we must redesign the nature of our educational institutions to allow for an integrated approach to the study and understanding of human ecological problems. This requires bringing together a wide range of viewpoints and the kinds of people who are inclined to engage in dedicated cooperative study and planning. We will need to explore and develop methods for achieving more than merely technical or economic solutions; solutions must also respond to cultural, environmental, and aesthetic values. In order to do this, we must study the failures that result from a lack of foresight and look ahead to the consequences of human action on our social and natural environment.

The establishment of desirable human and natural environments requires the invention of novel political and decision-making processes guided by pluralistic and democratic ideals. This will demand effective spokesmen and spokeswomen who can initiate a gathering of perspectives composed of a broad spectrum of views and who can coordinate such gatherings to provide guidance and effective management of complexity. These spokesmen must themselves be knowledgeable of the human ecology of the past and present and must be capable of foreseeing possibilities for cooperation and coordination, and for forging new relationships.

By providing a unifying framework, the study of human ecology will also help people in dealing with complexity on both educational and personal levels. It will help to overcome the competition between fields. By providing students with the knowledge to perceive, define, analyze, and contribute to the solution of human and ecological problems, it will allow them to overcome the fragmentation of knowledge, fragmentation of culture, and fragmentation of self.

In sum, then, human ecology combines a broad-based understanding of interrelationships of ecology with the insights of the humanities that makes graceful action possible. Its educational philosophy seeks to go one step further than the philosophy that guided the traditional liberal arts education. In that philosophy it was considered important to acquaint the individual with the relevant cultural context that determined the nature of the social world so that the individual could gain the capacity for intelligent and informed action. Human ecology education enriches the context of intelligent action by including the consequences of human action on the natural world. Thus the human ecology perspective seeks to enrich human choice by presenting a dynamic picture of the greater community in which action takes place, by changing the moral significance of actions, and by defining the nature of the problems which have to be solved to secure a livable and enjoyable human future.

Postscript

Our culture is a relatively young one and hasn't had a very long time to profit from its mistakes in the same ways as have other cultures that have been around for a longer time. Wisdom is always difficult to come by, and unfortunately can't be transplanted from one culture to another. Our path is different, and the wisdom that we seek must conform to our own peculiar styles and visions. We have no choice but to work with the actualities of our present world, however complex or contradictory they may be. How else can we hope to attain this wisdom except through a perspective that is able to draw together all the necessary ingredients?

III. N. Curriculum Reflections of America's Reconciliation with Nature

Jonoa Young, Rochester Institute of Technology.

Public concern about the changing character of the environment led to two diverse nature-related philosophies. Joseph M. Petulla (1977) captures a useful summary of the romantic and utilitarian views toward nature that came to be known as the preservation and conservation philosophies:

> The cross currents of the Enlightenment and Romanticism greatly influenced the elite of America's attitudes and activity, shaping its exploitation (thrust of progress) and conservation (scientific utilization or a preservationist spirit) of the natural resources. It is significant that the forerunners of the conservation movement arrived at their conclusion from quite distinct starting points: "resource conservationists" from the scientific movement within the Enlightenment and the "nature preservationists" from the enthusiastic and worshipful preoccupation with the wonders of nature. Therefore, resource conservationists would later insist that resources be wisely used but used nonetheless; nature preservationists wanted nature to be left alone and untouched. The disparate awareness of the two groups would cause chagrin and conflict among conservationists from the beginning of their movement to the present day (Petulla, 1977, p. 218).

Zais (1976) has described the public school curriculum over time. In the public schools prior to World War I, the Industrial revolution, urbanization, massive immigration and new theories in education were the dominant forces shaping curriculum. By the end of this period the science curriculum included theoretical considerations of Zoology and Botany. The curriculum responded to the progressive and practical influences with subjects such as nature study (p. 53), with an emphasis on self-development and democratic social competence. Zais (1976) mentioned nature study as a part of public school curriculum, but did not give details about its content or its prominence in the public school curriculum.

Peter Schmitt (1969) described the back-to-nature phenomenon that led to the nature study movement. It was believed that nature provided peace, tranquility and spiritual cleansing of the ills of urban life. The evil influences of the urban centers could be ameliorated by sojourns into nature. It was believed that children and adults were healthiest in the fresh air. However, nature would never replace sophistication of urban life.

Schmitt (1969) described the conflicts in attempts to establish nature study as a subject in the school curriculum in the early 1900s. The romantic-aesthetic view of nature conflicted with the scientific view. Teaching methods that used abstract book learning were criticized by advocates of the experiential method of teaching.

Schmitt (1969) points out that although considerable literary and curriculum activity occurred during this period "nature-study, like school gardening, never really established itself." In 1930, as in 1900, the movement continued, its rewards still anticipated, its contradictions unresolved. In any given period the problems were the same: methods not clear, teachers untrained, textbooks inadequate. Always a new text, a new dedication or a new pedagogical evaluation promised to turn nature into 'a real, bona-fide branch of study in the elementary school,' but somehow the movement never quite matured" (p. 93).

Between the two world wars, two liberal influences displaced the traditional conservative curriculum. According to Zais (1976), the first was the "business-efficiency or management orientation" (p. 55). This was supported by practical laissez-faire advocates that believed in "an efficient productive citizen in the emerging corporate state" (p. 55). This view led to vocational education and tracking and was most influential in the high school. The second influence was the progressive education movement championed by those interested in a "humane, more democratic society through individual growth and fulfillment" (p. 55). This philosophy dominated the lower grades and led to experimentation with the curriculum. The view that curriculum should focus on large problems related to life-situations brought about titles such as "Our Animal Friends," "Chills and Thrills," "Periodicals," and "Conservation of Resources" as part of the "language arts curriculum" (p. 66).

Between the two Roosevelt administrations, there was a change in the conservation philosophy as described by Petulla. Terrie (1985) notes a shift in attitude, around 1920, from the anthropocentric view of nature toward what became known two decades later as the Leopoldian ethic. He explains its subtleties as the foundation of a "modern wilderness aesthetic": "In brief, the modern love for wilderness combines respect for the integrity of the landscape; belief that human interference violates that integrity; appreciation of the total, dynamic, interdependent system of nature; faith in the capacity of the landscape and its natural constituents (including wildlife, plants and landforms) to manage their own affairs, even when this involves the loss to human society of economically valuable resources; and respect for the smallest details of nature as well as appreciation of the grand prospect" (p. 8). To this, he adds, consideration of the "condition of wilderness as an appealing characteristic of the landscape" (p. 8). Wilderness areas that were not so appealing are included in the new wilderness aesthetics and ought to be preserved as is.

Franklin Roosevelt was not an aesthetic purist. He believed that nature was to be used and renewed for the good of all. To an extent, this reflected Pinchot's 1900s forest management attitude, but added a futures and an aesthetic dimension. This second conservation ethic distributed resources equitably, as did the earlier ethic, and extended resource use to future generations. There was concern for the beautification of surrounding communities. Koppes (1983) suggested: "The primacy of nature and the commonwealth meant that long-range social goals should take precedence over short-term private interests. As Morgan said: 'We are not complete owners of the soil, but only trustees for a generation.' Their attitude took fundamentally an ethical stance. 'We must get a sense of personal responsibility toward the national resources as a whole,' said Ickes" (from Koppes, p. 19).

No matter how holistic this philosophy appeared to be, nature was still to be managed wisely and equitably, resource by resource, for the common good of man. The grand picture of nature meant order according to man's concept of nature, not according to natural order. The activities of the CCC program and the TVA projects reflected the second conservation ideal.

Although school curriculum remained under the influences described by Zais, some school curriculum contained conservation materials that reflected wise use and aesthetic themes. A 1937 bulletin published by the U.S. Department of the Interior reviewed the school curricula and presented their content. The opening statements in the document reflect the two themes. "Nature undisturbed maintains a balance of processes, which in effect is conservation, providing for, protecting, adjusting, and substituting when this balance is disturbed" (p. 1). According to the Department of Interior (1937), the fact that man had acted to destroy nature and waste natural resources presented society with a serious problem and justified the need for conservation education in formal schooling as well as in adult education. However, as the statement, "our God-given wealth" (p. 3) implies, nature did not hold the mystique of a living entity.

Zais (1976) noted that by 1950-1960, the efficiency model displaced the progressive movement and the socio-vocational, discipline-centered, curriculum took over. Wert & Quick (1977) point out that Governmental support for intervention in school curriculum began in this period and focused on the returning soldiers and the struggle to attain world technological dominance. There was little concern for environmental issues until the mid 1960s.

By 1965, reaction against social control and elitism of the discipline-centered curriculum caused reemergence of the humanistic aspects of the progressive era. Zais notes that concerns about "liberty, equality, self fulfillment and social justice" resulted from "intensifying awareness of America's racism, poverty, pollution, and, of course, involvement in the Viet Nam war (p. 71). The humanistic movement focused curriculum on man, problems of man and interdisciplinary problem solving. The roots of environmental education can be traced to this period.

The environmental movement began during the mid sixties and blossomed by the early seventies. Summed up simply, this movement brought together the ideologies of the Leopoldian and wilderness aesthetics, mentioned earlier, and flavored them with a bit of Arcadianism. Again, we see the belief that we could bring about social change through education. Added to this was the belief that we could legislate repairs to nature and that the Federal Government was to be the enforcer.

The Federal Government had already invested heavily in educational intervention during the past decade and had some apparent successes. The National Science Foundation Course Curriculum Improvement Project (NSFCCIP) curricula were well-known and some were institutionalized in the schools. The Elementary and Secondary Education Act (ESEA) and other reform programs, under the Office of Education, were in full swing. Education had an open checkbook during the final years of the Johnson Administration. Although skepticism was looming over federal intervention projects, the belief remained that schools must accept responsibility to alleviate social problems, an idea first articulated in the 1937 document. Congress enacted the Environmental Education Act of 1970.

After the enactment of that Act, a study of state curriculum Guides reveals that in a number of states the subject of the environment had its greatest presence between 1972-5. Few states legislated environmental education, however, a number of them created programs or hired experts to gather material and support educational efforts throughout their immediate arena. The holistic concept intended by environmental educationists soon gave way to concerns about conservation of energy. The presence of environmental material has declined in the past few years. A review of the 1970-1980 Fearon Pitman Cumulative Index for curriculum revealed that suggested courses and curricula with environmental topics expanded significantly after 1970. This does not mean that they were institutionalized into the public school curriculum.

I could only find a few curricula that reflected all the expectations of environmental education.

I scanned copies of public school texts in each subject distributed by the traditional text book companies for the years 1970-80. There is a bulge in topic specific environmental content in textbooks between 1972-1977, much of it spurred by the energy issue. One BSCS Green Version text reflected a comprehensive environmental theme. In the other texts, any comprehensive or controversial issues were placed at the end of the book. In my discussions with Rochester teachers who used the books, that material was rarely covered due to time constraints.

I reviewed the journals of the Outdoor Education Association. The Outdoor Education materials did not deal with the more controversial issues, rather they adhered to helpful discrete projects that could be used in the classroom from day to day. They reminded me of the Nature-study approach to the environment.

I reviewed the Journal of Environmental Education from 1970 to date, and the ERIC materials and proceedings from the North American Association of Environmental Education. There was considerable curriculum and literary activity in NAEE from the onset of the Act to the present. In general, there was great concern about the quality of environmental curriculum after 1970. Many of the topics mentioned in the Act were included in the curricula materials described in the journals. I found very few examples of the type of comprehensive curriculum implied by the Act.

In summary, my review showed that there is a plethora of environmental, nature-related and conservation material available. Prior to 1970 the curriculum reflected the philosophies of the day. After the environmental movement, there were few examples of curricula that met a majority of the objectives for environmental education implied by the Environmental Education Act.

There is considerable history of nature-related educational activity; however, the curricula failed to be institutionalized and remain as part of public school curriculum throughout the country.

Zais (1976) proposes that the history of American curriculum shows "that the curriculum has been determined by man, his culture, and his social institutions" (p. 73). Although there were events of societal concern about environmental degradation since the 1800s, and sporadic educational efforts to meet these concerns, it appears that society has not come to consensus about the appropriateness of environmental content in the curriculum or the role of schooling in reconciling nature.

REFERENCES

Periodicals

Atkins, J.M., & House, E.R. (1981). The Federal role in curriculum development, 1950-80. Educational Evaluation and Policy Analysis, 3(5), 5-35.

Cumulative index for curriculum. (1970-80). Fearon Pitman Curriculum Development Library. 3-5.

Current issues in environmental education and environmental studies. (1975-1983) ERIC. 1-8.

Hays, S.P. (1982). From conservation to environment: Environmental politics in the United States since World War Two. Environmental Review, 6(2), 14-33.

Koppes, C.R. (1983). Environmental policy and American liberalism: The Department of the Interior, 1933-1953. Environmental Review, 7(1), 17-33.

Journal of Environmental Education. (1970-1984).

Books

Broudy, H.S. (1972). The real world of the public schools. New York: Harcourt, Brace & Jovanovich.

Hays, S.P. (1959). Conservation and the gospel of efficiency: The progressive conservation movement, 1890-1920. Cambridge, MA: Harvard University Press.

Marsh, G.P. (1864). Man and nature. Lowenthal, D. (Ed.), (1974). Cambridge, MA: Harvard University Press.

Mitchell, L.C. (1981). Witnesses to a vanishing America: The nineteenth-century response. Princeton, NJ: Princeton University Press.

Leopold, A. (1949). A Sand county almanac: Oxford University Press.

Petulla, J.M. (1977). American environmental history: The exploitation and conservation of natural resources. San Francisco, CA: Boyd & Fraser.

Schaffarzick, J., & Sykes, G. (Eds.), (1979). *Value conflicts and curriculum issues: Lessons from research and experience*. Berkeley, CA: McCutchan.

Schmitt, P.J. (1969). *Back to nature: The arcadian myth in urban America*. New York: Oxford University Press.

Smith, H.N. (1950). *Virgin land: The American west as symbol and myth*. New York: Vintage Books.

Terrie, P.G. (1985). *Forever wild: Environmental aesthetics and the Adirondack forest preserve*. Philadelphia: Temple University.

Warren, D.R. (Ed.), (1978). *History, education, & public policy*. Berkley, Ca: McCutchan.

Zais, R.S. (1976). *Curriculum: Principles and foundations*. New York: Harper and Row.

Reports and documents

Bristow, W.H., & Cook, K.M. (1937). *Conservation in the education program*. Bulletin No. 4 U.S. Department of the Interior. Office of Education. Washington, DC: U.S. Government Printing Office.

Wert, J., & Quick, S. (1977). *National curriculum projects and development in education* (Contract No. g-74-0069). National Institute of Education (DHEW). (ERIC Document Reproduction Service No. ED170268).

IV. Presentations:
Environmental/Education Policy

IV. A. The Garrison Diversion Project

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The Garrison Diversion is a water diversion project intended to irrigate arid lands in North Dakota. The project would bring water from the Missouri River across the Continental Divide into the Red and Souris Rivers. These rivers eventually cross the U.S./Canadian border into Manitoba on their way to Hudson Bay. Concerns over water pollution and the alteration of aquatic flora and fauna have prompted the Canadian and Manitoba governments to oppose the Diversion. The Garrison Diversion could set a precedent for further negotiations of proposals to divert Canadian water to the United States.

IV. B. "Public Input" as Opportunity for Environmental Education: Resource Management Plans as an Example

Gene Bammel, Division of Forestry, West Virginia University.

"We see our role as managing the forests the way the public wants it."--a Forest Service planning officer.

The Resource Planning Act of 1974 mandated public input in the management plans for federally owned land. With the passage of the National Forest Management Act of 1976, certain demands on forest planners were elaborated, as was a procedure for insuring public input for the legally mandated forest plans.

The Forest Service had long utilized the opinions of selected individuals in developing management plans, and the Forest Service assumed that the procedure that had been conducted casually could now be formalized so as to include all interested publics (Hendee, 1973). In practice, it soon became clear that institutionalizing public involvement would cause some serious difficulties. Public forums became opportunities for interested groups to exert pressure on public officials, and alienated individuals may participate only to express resentment or hostility (Twight, 1977).

Perhaps the most serious problem with the public input program is that, instead of being a forum for the exchange of ideas, it may be regarded as a plebiscite, as if the numbers of people who speak up on a certain issue might be taken as a "vote" for a particular management choice (Fairfax, 1975). The potential for misunderstanding in this area is considerable. Particular interested parties, whether they be hunters, hikers, miners or lovers, might make it appear that a large segment of the public prefers a particular management choice, and might appear to be in a position to dictate policy. So complex is the program of public input, that some forestry professionals call for a recantation by Congress, a repeal of the Resources Planning Act and the National Forest Management Act, and the return of forest planning to competent professionals (Behan, 1985).

The Monongahela National Forest

All of the units of the National Forest system published alternative forest plans in early 1985. All completed the public involvement stage, and are in some stage of revision of their Plans, for final publication in late 1985 or early 1986. These plans each include immediate management prescriptions, and a tentative long range plan. After the initial proposal was made public, officials from the respective Forests arranged forums at which the proposals were briefly summarized, and the public had an opportunity to express opinions. Letters or phone calls were requested, to formalize points of view.

Some Forest Plans drew very little response; the Daniel Boone National Forest in Kentucky, for example, drew only 22 responses. The Jefferson National Forest in Virginia, much used by eastern seaboard cosmopolities, drew 1400 responses. But the Monogahela National Forest in rural West Virginia drew 3597 letters and more than 300 phone calls, the largest response in the nation. Why did this occur?

Ralph Mumme, the Supervisor of the Monogahela National Forest, cited "miscommunication" as the reason for the large response. The Forest Plan projects timber cuts and road building over the next 50 years, and some readers of the documents perhaps did not understand either the timespan involved, or the tentativeness of long-range projections. Two other aspects of miscommunication are important: (1) the establishment of long-range timber procurement goals by the federal government, and (2) the tremendous complication of forest management for multiple use, sustained yield.

Public Involvement programs should work for educational purposes in two directions: it should give the Forest Service some awareness of what local clientele groups expect from the Forest; but it should also work as a Forum for the Forest Service to explain to the public what is involved in the management of a major natural resource, in terms of meeting national as well as local needs.

Several clientele groups seemed to be at loggerheads with the designers of the Monongahela National Forest plan. The West Virginia Wildlife Federation strongly objected to the apparent decrease in bear and turkey habitat; the forest planners wanted more opportunity for deer, snowshoe hare, squirrels and other game. The Sierra Club and the West Virginia Highlands conservancy wished to insure the permanence of "remote recreation opportunities," while forest planners had assumed that since half the Forest offered such recreation, that should suffice.

Perhaps the clearest instance of miscommunication involved conversion to white pine. The Forest is predominantly hardwood, and for very good silvicultural reasons the original plan called for a conversion of about 100,000 acres to pine. 1400 letters opposed this alteration, and the alternative will be dropped.

What has been learned from this round of resources planning, and what can be done to improve the process in the future? First of all, it is clear that using these forums for environmental education is a matter of too little, too late. By the time public forums on draft environmental impact statements occur, people with vested interests or people who are suspicious of bureaucrats are in no mood to listen to a discourse on scientific forest management. If the National Forests are to be managed to maximize all possible values, more attention must be paid to persistent and continual explanations to the public of what forest management attempts to achieve, and how forests provide a multitude of benefits, without being managed exclusively for any one purpose. There must be a continual dialogue between managers and users, so that when plans are published great and unexpected diversities do not occur. It was apparent from the public forums presented by officers of the Monongahela National Forest that most of the public took the benign management of the Forest for granted, and only mobilized or polarized their forces when they felt threatened.

The second lesson from this round of Forest Land Management planning is that we can't go on operating like this. Suspicion of the power of big business or of lobbying groups has often alienated individuals; but in this planning process, the power of individuals may have been exercised in ways counterproductive to their own best interests. In the case of the Monogahela, far less timber will be harvested, no coal will be leased, fewer and lower standard roads will be built, and the diversity of the Forest will be limited. The original prescription called for 45 percent remote land; the revised prescription will reach for approximately 70 percent. This may be viewed as a victory for environmentalists and preservationists, and in some ways it is. The public (or at least a vocal public) has spoken, and habitat will be preserved and remote recreation will be facilitated.

Environmentalists have learned to be suspicious of the purposes of big business, and the agencies of the federal government have often been accused of seeking development at the expense of preservation. But the experience of the Monongahela National Forest serves as a strong indicator that more must be done to inform the public as to the benefits of multiple use, sustained yield. More must be done to create a climate of understanding, so that rational, scientific principles of forest management will be a part of the decision-making process, and the forest may be managed the way the public wants it, in the long-term best interests of both local and national publics.

REFERENCES

Behan, R.W. 1985. National Forest Planning: Will It Ever End? American Forests, March, 1985, pp. 10ff.

Fairfax, S.K. 1975. Public Involvement and the Forest Service, Journal of Forestry, 73:657ff.

Hendee, J.C., et al. 1973. Public Involvement and the Forest Service. USDA-Forest Service, Washington, D.C.

Twight, B. 1977. Confidence or More Controversy: Whither Public Involvement? Journal of Forestry, 75:93ff.

IV. C. Paradigmatic Change and the Sustainable Society: Shoring Up Environmental Education Foundations*

Douglas K. Bogen, Cornell University.

> If one cannot think without mental patterns--and in my belief, one cannot--it is better to know what they are; for a pattern of which one is unconscious is a pattern that holds one at its mercy.
>
> Arnold Toynbee (1956)

New Perspectives

Whether we always realize it or not, environmental education (EE) in its modern form is representative of a broader and more profoundly challenging perspective on the world than has been recognized in traditional western educational directions. We live in a world that, through the benefits of science, is increasingly opened up for our observation and manipulation, yet we often find that our basic perspective has not changed; we have not found the collective wisdom to make our society sustainable within the greater scheme of things. The problem of attaining an appropriate perspective on life and knowledge of its working is crucial in our time, since many of the critical environmental problems our society faces seem to derive more from ignorance and delusion rather than from selfishness and corruption. A both broad and deep ecological perspective is needed to deal adequately with the many current crises that have become subsumed under the term "environmental."

How are we to approach this problem of achieving general "environmental literacy?" The standard view is that it is a matter of grasping scientific knowledge, that once one understands the principles of ecology and environmental constraints, responsible attitudes and actions will follow. At the same time, science and scientific developments are often seen as the source of many of our environmental problems, leading many to turn away from it or ignore the complexities that scientific thought implies. This situation often results in educational materials that people cannot or will not understand and programs that, no matter how sophisticated or conscientiously produced, do not work toward the stated goals of EE expressed by its leaders (Hungerford, et al., 1984; Volk, et al., 1984).

Part of the way out of this dilemma may lie in a re-examination of the goals and methods of acquiring scientific knowledge and knowledge in general. The New Philosophy of Science (Kuhn, 1970; Brown, 1979) proposes that the development of scientific knowledge not be seen as a purely accumulative process, but should be understood as evolutionary and contextual, with periodic "revolutions" in perspective that reorganize the foundations, methods, and goals of scientific work. Once we begin to see scientific "progress" as an evolving process, subject to societal influence and intellectual circumstances, its true value--and limitations--for understanding the world and our place in it can be explored. This sort of viewpoint could go a long way toward setting the foundations for an EE process that works toward real ecological enlightenment through a broader perspective on the workings of the natural world and our appropriate role within it.

Paradigms and Societal Change

A basic tool in this effort is the concept of a paradigm. This concept was developed by Thomas Kuhn (1970) to give substance to the underlying perspectives, assumptions, and techniques that scientists use to formulate their hypotheses and theories about their subjects of study. Paradigms are models of thought, ways of seeing the world that are foundational to any scientific enterprise. They are points of view that are taught in "acclimatizing" newcomers to a discipline, and they have the characteristics of dogma through their definition of accepted kinds of questions to be asked and solutions to be sought. While the paradigm concept found its first strict application in philosophy of science, it has rapidly come into common usage in most social sciences, at least among the more innovative theorists (e.g., Ritzer, 1975; Daly, 1977; Ophuls, 1977; Hardesty, 1980). Its usefulness for our present purposes lies in its application to the foundations of society as a whole, as has been done by Pirages (1978), Dunlap (1980), and Markley and Harmon (1982), among other sociologists. When we look at our societal norms, values, and commitments in terms of different paradigms of thought, we can begin to make some sense of the profound changes our society is going through.

A crucial characteristic of paradigms is that they change, or more precisely, their adoption replaces older, less functional paradigms and they themselves are eventually replaced by new paradigms that "fit" the current reality better. Kuhn (1970) has termed this replacement process a "paradigm shift," and he sees it as a periodic occurrence within the development of scientific thought. In the history of science, paradigm shifts have been thought to occur in response to periods of crisis as to theoretical foundations of a discipline (e.g., during the time of Copernicus or the development of quantum theory) where new evidence increasingly contradicts established theory and there is mass, incommensurable disagreement among practitioners.

On the societal level, basic paradigm shifts are rare and unusual developments occurring only perhaps every four or five centuries throughout western civilization (Mumford, 1956; Capra, 1982). They are accompanied by more recognizable major social, intellectual, or spiritual revolutions, such as occurred with the spread of Christianity or the rise of modern science. The sociologist Pitirim Sorokin (1937-41; 1941) has analyzed such trends throughout history and in various civilizations and was able to construct a model of societal dynamics that describes a strikingly similar pattern to that of Kuhn's for the development of science. The importance of this general model for the present context is that it identifies the present period as a similar time of great transition in human culture and that it brings a necessary and greater perspective to the various crises we face.

Competing Worldviews

Using this model for societal change, we can begin to analyze current trends in terms of competing societal paradigms, or worldviews. Before identifying the distinguishing characteristics of proposed old and new paradigms in western society, it will be worth making some brief points about applying paradigm theory to society as a whole.

By attempting to characterize general trends in society in terms of progressive paradigms, it should not be supposed that all major events and ideas within a society are directly related to or symptomatic of an overarching paradigm of thought, nor that all people or even a majority in a society would overtly subscribe to or even be cognizant of such a controlling view. Given conceptual structure and characteristics, a paradigm becomes an intellectual abstraction that would be of little use or concern to most people. However, this does not mean that people would not be influenced by nor acquiesce to the general thrust of a dominant paradigm; if a social system is constructed and defended around certain underlying principles, then all those who take part in the system are relating themselves to that view, whether consciously or not.

At the point of a paradigm shift, there will be an old, previously dominant, paradigm and a new, previously subordinate paradigm. These should be seen as historically based and collectively constructed, and each as rapidly evolving and spreading as it becomes the accepted view. This societal transformation can be thought of as a "creative disintegration" (Roszak, 1978) of the social system based on the old paradigm, with previously subordinate ideas and structures rapidly becoming dominant. Thus, this theory does not necessarily project the "downfall" or modern society, at least not in any absolute sense, though it does assume a thoroughgoing transformation in the ways we relate to our environment and to each other, as prerequisite to the attainment of a sustainable society.

Briefly, the old paradigm that has dominated our society over the modern period is characterized by philosophical as well as economic mechanicism, an emphasis on reductionist modes of thought and research, authoritarian power structures, growthism, and an objectification and domination of nature. These ways of dealing with the world are mostly offshoots of the scientific revolution of the seventeenth and eighteenth centuries (Liess, 1972; Merchant, 1980; Capra, 1982), though attitudes toward growth and domination of nature can be traced back to origins in Judeo-Christian thought (White, 1967; Black, 1970; Barbour, 1973). Though most modern-day people would not subscribe to these ideas in their strict formulations, they can be seen to have had a foundational effect on much of modern economic, political, philosophical, and medical, as well as natural science, theory (Rifkin, 1980; Capra, 1982).

The new paradigm that is beginning to grow in influence and substance is based on the principles of ecology and systems thinking, with a renewed emphasis on holism, biocentrism, intertranscendence, and conviviality. It had roots in ancient "perennial philosophy" (Huxley, 1945) as well as ecology

(Worster, 1977), systems theory (Jantsch, 1980), and quantum physics (Capra, 1982). This ecological, organismic view of the world can provide the intellectual as well as spiritual foundations for the development of a truly sustainable society. Some of the societal ramifications of the alternative views of the future that these competing paradigms present are discussed by Robertson (1978).

Environmental Education and Paradigmatic Change

How does EE relate to this proposed pattern of paradigmatic change? Presumably, most environmental educators would find themselves more in agreement--at least on the face of it--with the perspective of the new ecological paradigm than with the dominant western paradigm, as outlined here. We generally have at least intuitive sense that our traditional educational system and our societal structure in general are not conducive to promoting ecological understanding and action. Nevertheless, the field's diverse origins in nature study, conservation education, outdoor education, and the environmental movement of the 1960s have left it with varied and often divergent philosophical foundations and perspectives. Thus, we find numerous admissions of disagreement as to the domain and goals of EE (e.g., Roth, 1976; Harvey, 1976; Schmeider, 1977; Disinger, 1983). The point here is that the field of EE as a whole, due to prior commitments and current political realities, reflects attitudes derived from both paradigms, as do many progressive efforts in this period of transition.

The political and philosophical complexity of this issue of paradigm allegiance would tend to excuse the lack of bold statements of commitment to new ideology, if it were not for the continuance of obsolete ideas that seems to result by default. In the most comprehensive effort to delineate the substantive structure of EE (Harvey, 1976) found in the literature, there results a definite though perhaps inadvertent bias and reliance on philosophical foundations that are at least formally tied to the view of the dominant paradigm. In addition, much of the educational research done in the name of EE is similarly tied to theories and methodologies that derive from the old paradigm and is thus constrained by the explanatory limitations of that paradigm.

Despite these theoretical failings, EE as it is constituted and practiced has a number of qualities that make it key to paradigmatic change. With the "subversive science" of ecology as its main disciplinary foundation, EE is inherently challenging of the unecological bases of our socioeconomic system. Ecological knowledge put into a broader, paradigmatic context forces us to re-examine some of our most basic beliefs and perspectives--a process essential for a shift of paradigms. Another aspect often found in EE that is relevant to the paradigmatic transition presented is the emphasis on building and understanding relationships, not just among natural phenomena, but also between the learner and the "subject." This perspective is essential to the new paradigm and is easily promoted through EE methods. Related to this goal is the need for cognitive/affective integration in school learning. One way or another, EE involves affective and well as cognitive understandings, and it could provide a model for more holistic education that works to develop the whole person and provide him or her with the creative thoughts and feelings necessary for taking positive action in the world. Perhaps the greatest potential for EE in terms of paradigmatic change is in bringing back values as crucial considerations in dealing with the world. EE is values education, and it could go a long way toward mending the fact/value split that has broken the essential bonds of western society to the natural world.

We can thus begin to see the usefulness of a paradigmatic perspective for clarifying, strengthening, and justifying the foundations of EE as a crucial effort for social change. It is vitally important that theorists, innovators, and leaders in the field become more familiar with this perspective and begin to explore its ramifications for the future of EE, and for a sustainable human future.

REFERENCES

Barbour, Ian G. 1973. "Introduction," in Barbour, Ian G., ed. Western Man and Environmental Ethics. Reading, Mass.: Addison Wesley.

Black, John N. 1970. The Dominion of Man. Chicago: Aldine.

Brown, Harold. 1979. Perception, Theory and Commitment: The New Philosophy of Science. Chicago: University of Chicago Press.

Capra, Fritjof. 1982. The Turning Point: Science, Society and the Rising Culture. New York: Simon and Schuster.

Daly, Herman E. 1977. Steady-State Economics. San Francisco: Freeman.

Disinger, John F. 1983. "Environmental Education's Definitional Problem," Information Bulletin #2. Columbus, Ohio: ERIC/SMEAC.

Dunlap, Riley E. 1980. "Paradigmatic Change in Social Science," American Behavioral Scientist, 24:1.

Hardesty, Donald L. 1980. "The Ecological Perspective in Anthropology," *American Behavioral Scientist*, 24:1.

Harvey, Gary D. 1976. *Environmental Education: A Delineation of Substantive Structure*. Unpublished Ph.D dissertation, Southern Illinois University at Carbondale.

Hungerford, Harold R. and Trudi Volk. 1984. "The Challenges of K-12 Environmental Education," *Monographs in Environmental Education and Environmental Studies*, Arthur B. Sacks, ed. 1:3.

Huxley, Aldous. 1945. *The Perennial Philosophy*. New York: Harper and Bros.

Jantsch, Erich. 1980. *The Self-Organizing Universe*. New York: Pergamon.

Kuhn, Thomas S. 1970. *The Structure of Scientific Revolutions*, 2nd. ed. Chicago: University of Chicago Press.

Leiss, William. 1972. *The Domination of Nature*. New York: G. Braziller.

Markley, O.W., and Harmon, Willis W., eds. 1982. *Changing Images of Man*. New York: Pergamon Press.

Merchant, Carolyn. 1980. *The Death of Nature*. New York: New Directions.

Mumford, Lewis. 1956. *The Transformations of Man*. New York: Harper.

Ophuls, William. 1977. *Ecology and The Politics of Scarcity*. San Francisco: Freeman.

Pirages, Dennis C. 1978. *The New Context for International Relations: Global EcoPolitics*. North Scituate, Mass.: Duxbury Press.

Rifkin, Jeremy. 1980. *Entropy: A New World View*. New York: Bantam.

Ritzer, G. 1975. *Sociology: A Multiple Paradigm Science*. Boston: Allyn and Bacon.

Robertson, James. 1978. *The Sane Alternative*. St. Paul, Minn.: River Basin Pub.

Roszak, Theodore. 1978. *Person/Planet: The Creative Disintegration of Industrial Society*. Garden City, New York: Anchor/Doubleday.

Roth, Robert E. 1976. *A Review of Research Related to Environmental Education 1973-1976*. Columbus, Ohio: ERIC/SMEAC.

Routley, Richard. 1982. "Roles and Limitations of Paradigms in Environmental Thought and Action," *Discussion Papers in Environmental Philosophy*. Canberra: Australian National University.

Schmeider, A.A. 1977. "The Nature and Philosophy of Environmental Education: Goals and Objectives," *Trends in Environmental Education*. Paris: UNESCO.

Sorokin, Pitirim A. 1941. *The Crisis of Our Age: The Social and Cultural Outlook*. New York: E.P. Dutton.

-------, 1937-41. *Social and Cultural Dynamics*, 4 vols. New York: American Book.

Toynbee, Arnold. 1956. "What I am Trying to Do," in Montagu, M.F. Ashley, ed. *Toynbee and History: Critical Essays and Reviews*. Boston: Porter Sargent.

Volk, Trudi, H. Hungerford, and A. Tomera. 1984. "A National Survey of Curriculum Needs as Perceived by Professional Environmental Educators," *Journal of Environmental Education*, 16:1, Fall.

White, Lynn, Jr. 1967. "The Historical Roots of Our Environmental Crisis," *Science*, 155:1203-1207.

Worster, Donald. 1977. *Nature's Economy: The Roots of Ecology*. San Francisco: Sierra Club Books.

IV. D. Political Involvement of National Environmental Education Associations: An Australian Example

Brian Foreman, Immediate Past Secretary, Australian Association for Environmental Education.

The Australian Association for Environmental Education (AAEE) was formed in 1980, and since that time has grown to be a persuasive influence in the development and maintenance of programs, resources, and activities for Environmental Education (EE) in the country. This has been achieved specifically by organizational structures and approaches which best produce political recognition, from two sides; from the government and non-government agencies in control of policy development and finance, and from practicing professionals and organized services already established in the field.

Need for a Watchdog

In the Australian Federal political system, the States are responsible for activating programs and policies in Environment and in Education, but they are at the mercy of Federal government policy and the relevant bureaucracies which determine levels of funding through grants to the State system. While local activity in EE has been strong and growing in most States for some years, it appeared to have a tenuous future and sometimes a fragile infrastructure. Project officers have become easy victims of budgetary cost-cutting, particularly when this has been determined by ease of enactment rather than sound philosophical grounds.

There has clearly been a need for a national watchdog in Environmental Education, and while the AAEE was not specifically formed for this purpose, circumstances dictated for a strong emphasis in this role. The AAEE needed quickly to establish its credentials in the field, and did so by building a large broadly-based membership from academic, the range of consultative services and educational resource developers, interpretive staff, and key personnel in a range of government, non-government and voluntary agencies who identified with the Association's aims. AAEE also produced a high quality newsletter, began to promote and/or organize national events, and specifically to make itself known to Federal government agencies who fund and promote EE programs.

Establishment and Structure of AAEE

The Association grew from a Federally funded Environmental Education Project, which had a National Director and a Liaison Officer in each State. This Project funded and controlled the development of a range of teaching resources for EE and provided a national newsletter, but was the catalyst for establishing the AAEE when the Project terminated. This evolutionary process, adapting to meet changing circumstances, has been a feature of the growth of the Association.

Nomination of members for election to the Executive and Council of AAEE was often influenced by the individuals' prominence in terms of gaining access to Cabinet Ministers, the size of their travel budgets, the ready availability of secretarial services, and overall credibility as a spokesperson for EE.

The first three Executives, each with a two-year term, have been elected on those criteria, and their ability to meet monthly or more often, to promote the growth and political profile of the organization. Executive members are at one time all from the same State, and are advised and supported by a Council comprising delegates from every State, plus two

Vice-Presidents and the Immediate Past President, also from States away from the Executive.

International Role

A national body, in addition to purposes within and across the country, must provide a point of reference on the international scene. To this end the AAEE has sought to be involved in international forums and has encouraged international participation in its activities. Of particular note to North Americans would be the contributions made in the growth of AAEE by Chuck Hopkins and Bill Stapp, both key practitioners and promoters of EE on this continent. Chuck Hopkins has been a keynote presenter and facilitator at our first and third National conferences, and Bill Stapp filled those roles at our second conference as part of twelve months he spent in Australia as a Fulbright Scholar. The AAEE was a co-sponsor of that Scholarship and received substantial impetus at the political level by the lobbying done by Bill Stapp during his time in the country.

National Conservation Strategy

A high point of the AAEE growth as a political force occurred during the development of the National Conservation Strategy of Australia, when the AAEE was not only invited to participate as the sole representative of Education in the debate, but succeeded in changing substantial emphases in the Strategy draft, to give more prominence to education as the linchpin of the "Priority National Actions." As the direct result of the AAEE influence at the Strategy Conference, the AAEE President was subsequently appointed to the Interim Consultative Committee on the NCSA, a high level committee to convert agreed Strategy proposals into recommendations for government action.

Since this level of involvement with the Federal government had been established, the AAEE was invited to co-organize the 1985 Seminar on Environmental Education, with the Federal Department of the Arts, Heritage and Environment. This is to become an annual event, involving Government/AAEE cooperation. The AAEE is also represented on the Education and Information Subcommittee to the Australian Environment Council (a Council of State Environment Ministers).

Federal Support and Interaction

The Federal government supports AAEE activities with grants to support the costs of Biannual National EE Conferences, and additional operating costs. In spite of this apparent symbiotic relationship, the Association remains independent and enterprising in its policies, and it continues to lobby in energetic fashion in the corridors of power. It maintains its credibility and access to senior policy makers by maintaining a professional image and persistent approach.

The AAEE tackles major board-based issues on policy direction and funding emphasis and allows its locally-based equivalent to grapple with local issues. Because of its nature AAEE engages in very little grass roots activity--the province of State associations and chapters--and concentrates on raising the awareness of government and industry at a Federal level. The Association has lobbied certain State cabinet Ministers when local action needed additional support, but the approach was still to emphasize the need for strong local services from a national perspective.

At the suggestion of Bill Stapp, the AAEE has involved more leaders of industry in its activities. This was also coincident with the involvement of industry leaders in thee development of the National Conservation Strategy consensus. This has further developed the broad base and has provided new opportunities to involve and/or influence other sections of the power base in our community.

In Summary

The Australian Association for Environment Association has provided a national network for its membership, a major forum for governmental and community interests in EE through its national conferences, and the stimulation provided by international involvement. Much of the unseen work is donee through meetings and correspondence with senior officials whose focus on EE activities across the country needs to be maintained. The success of the latter role needs to continue if other services down the line are to grow in effectiveness. This role is a key component of the work of the Executive on National bodies.

IV. E. The Task Force on Northern Conservation: Considerations for Participation and Education.

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Introduction

In March 1983, a National Workshop on Northern Conservation Policy was convened in Whitehorse, Yukon Territory, Canada. In response to a recommendation arising from this 1983 Workshop, the Minister of Indian Affairs and Northern Development appointed a Task Force on Northern Conservation. This Task Force was representative of industry, conservation, and territorial and federal government interests. The mandate of this group was to:

> ...develop a framework for the creation of a comprehensive conservation policy for the Yukon Territory and Northwest Territories (N.W.T.), and a strategy for its implementation that will help to ensure the wise use of all land, water and other natural resources. (Report of the Task Force on Northern Conservation, 1984, p.5)

The Task Force made several recommendations to the minister, including the development of an information-education component as part of a new approach to northern conservation. This, they point out, must be transactional in nature, providing a multi-dimensional communication network between all participants including governments, industry, and the public.

It will be argued that the model outlined in this paper should encourage the development on an information base and procedural infrastructure to assure thoughtful, positive, and meaningful public participation the development of a northern conservation strategy. Furthermore, participation in this policy planning, and planning the educational programs that will support these policies, are interrelated.

It is further argued that the reception and effectiveness of educational programs aimed to facilitate policy changes will be dependent upon a context evaluation which describes people's beliefs, attitudes, concerns, and knowledge. This same evaluation should also provide data essential for effective policy-making. Specifically, data could be provided that may be regarded as a pre-requisite to the development of curricular projects aimed at educating people about the proposed changes.

Considerations for Public Participation

The Task Force on Northern Conservation points out the need for meaningful public participation in the development and implementation of a northern conservation program. Vital to this process will be communication and educational programs which, while allowing increased access to decision-makers, will foster the development of an increasingly informed public. This need is consistent with current societal demands for participation in innovative matters. Improved planning should in turn be facilitated as the public becomes better informed and develops a better understanding of the range of options available and concepts involved. Meeting this need for enhanced public participation will, however, require a shift towards a more collaborative and proactive process for environmental planning.

Common criticisms of current participatory processes suggest that they are often unrepresentative of public views. Those who do choose to participate are often insufficiently informed or prepared to do so effectively. Alternatively, representative information can be gathered, but again the data are generally derived from a poorly informed public. Information derived from these types of sources will not, in itself, provide an adequate foundation for launching into the development of long term conservation policies.

The work of Chin and Benne (1976) describes approaches to planned change that should allow educators to increase the effectiveness of their programs.

1. The empirical-rational strategies for change, through education, rely on an understanding of the public's readiness to be educated. In other words, proposed changes will be readily adopted if they can be rationally justified, and be shown to be in the self-interest of those to be affected. These strategies are most effective when there is a general readiness in the population to accept a proposed change.

2. The second group of strategies are referred to as normative-re-educative. These strategies assume that patterns of public behavior are supported by sociocultural norms. Changes are therefore possible only when those involved change their normative orientations from old patterns to new ones.

3. Power-coercive strategies rely on the application of power as a means of bringing about social change. Although power is involved in the first two strategy types, power-coercive strategies emphasize political and economic power. Public attempts to gain access to the decision making process can be regarded as power-coercive strategies, as can the imposition of governmental policies.

There is some indication that more than one of these strategies are required to effect long-lasting change (Wideen and Holborn, in press).

The model presented here attempts to bridge the gap between past criticisms of the public participation processes and the requirements of Chin and Benne's framework for effecting change. The bridge relies upon evaluation to guide and refine educational programs. It is assumed that knowledge of the antecedent conditions, derived through context evaluations, will be essential to the development of effective programs. Further program refinements can be made with the aid of formative evaluation strategies.

Evaluation

The major thrust to the evaluative procedure advocated to facilitate the implementation of a northern conservation strategy would be a thorough context evaluation. Refinement of resulting communication and educative programs would be assisted by formative evaluations (Figure 1).

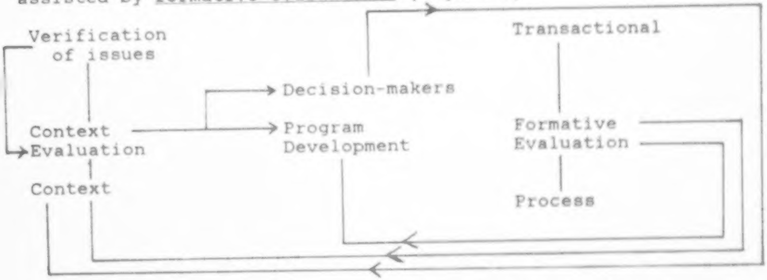

Figure 1. An evaluation model to facilitate the implementation of a northern conservation strategy.

Context evaluation. A context evaluation would establish the antecedent conditions and provide input for the decision makers involved in the development and implementation of the change. In light of Chin and Benne's (1976) framework, this input will prove crucial to the development of effective education programs.

Human systems are dynamic, and issues change or become modified over time. Repeated context evaluations help the decision-maker and educator provide new information to help gauge these changes and guide further program developments. These repeated context evaluations would also be in a sense summative, in that they would allow the evaluator an opportunity to identify change in the antecedent conditions which might have arisen out of an exposure to the educative process.

Stages of the proposed context evaluation include:

Issue generation. Through direct transactional communication the researcher would identify issues relevant to those concerned with the proposed changes. In addition to the public's perceptions and priorities for northern conservation, the researcher would identify their readiness for educative programs, the attitudes and beliefs that describe the normative orientations, and the perceived anxieties and tensions associated with the proposed changes.

Issue selection. Issue generation data is analyzed to identify consistent themes and the most salient issues. When feasible, these should be validated by encouraging the contributors to review the selections and to comment on their accuracy. Adjustments could be made, if necessary, at this point. The themes and issues thus identified provide the basis for questionnaire development that is truly responsive to the needs of the public, the decision makers, and the curriculum developers.

Questionnaire administration. The questionnaire is administered to a large and representative sample of the population. Kellert and Berry (1980) have suggested personalizing the process by presenting the questionnaire verbally through the interview medium. Although this is more time-consuming, it does encourage greater returns and question clarification, and meets the needs of the northern public where functional illiteracy is not uncommon. When surveyed in this fashion, the public has the opportunity to respond to relevant contemporary issues. They have a forum to express their views, anxieties, tensions, and pre-dispositions towards educational programs. This information, as has been discussed, could then be utilized by decision-makers and curriculum developers.

Finally, the context evaluator should be external to the change process. If there is to be a climate for trust and co-operation, the evaluator must be perceived to be free from manipulation by any portion of the public, including governments, industry, or interest groups. Furthermore, the findings of such an evaluation must be made freely available to everyone.

Formative Evaluation

The development of appropriate curriculum innovations, mindful of the public's needs, is enhanced by evaluative procedures which provide feedback to the curriculum developers and teachers. These innovators and practitioners, having established goals and objectives, will require information which will allow them to make program improvements. These may include re-adjusting their perceptions of the conditions arising from the context evaluation, refining their goals and objectives, and improving the total evaluation effort (Bennett, 1977). Transactions between those involved in the change, and the processes implemented to facilitate the change would be evaluated.

The framework developed by the Task Force suggests the need for significant departures from the standard practices of decision making. This paper attempts to augment the Task Force recommendations regarding communications and educational development. Acceptance of these views will be challenging.

Can decision makers and the public grow together towards a better understanding of their concerns? Can they, through this understanding, generate more acceptable options for the resolution of these concerns? These are the challenges.

REFERENCES

Bennett, D. 1977. The evaluation of environmental education learning. In Trends in Environmental Education. Paris: United Nations Educational, Scientific and Cultural Organization.

Berger, T.R. 1977. Northern Frontier Northern Homeland--The Report of the MacKenzie Valley Pipeline Inquiry: Volume One. Ottawa: Minister of Supply and Services Canada.

Brody, H. 1981. Maps and Dreams. Vancouver: Douglas & McIntyre.

Bybee, R.W. 1979. Science education for an ecological society. The American Biology Teacher, 14, 154-163.

Canadian Wildlife Service. 1983. Importance of Wildlife to Canadians. Ottawa: Minister of Supply and Services Canada.

Capra F. 1982. The Turning Point. New York: Simon & Schuster.

Chin, R., & K. Benne. 1976. General strategies for effecting change in human systems. In W.G. Bennis, K.D. Benne, R. Chin, & K.E. Corey, The Planning of Change. New York: Holt, Rinehart, & Winston.

Federal Environmental Assessment Review Agency. 1984. Beaufort Sea Hydrocarbon Production and Transportation Final Report. Ottawa: Minister of Supply and Services Canada.

Hudspeth, T.R. 1983. Citizen participation in environmental and natural resource planning, decision-making, and policy formation. Current Issues in Environmental Education and Environmental Studies, (Vol. 8, pp. 277-298). Ohio State: ERIC Clearing-house for Science, Mathematics, and Environmental Education.

Heberlein, T.A. 1976. Some observations on alternate mechanisms for public involvement: The hearing, public opinion poll, the workshop and quasi-experiment. Natural Resources Journal, 16: 197-212.

Kellert, S.R., & J.K. Berry. 1980. Workshop on Assessing Attitudes, Knowledge and Behaviors toward Wildlife--Focus on Alaska. Yale: U.S. Fish and Wildlife Service, Yale School of Forestry and Environmental Studies.

Kyler, D.C. 1984. Integrative models in environmental planning. Journal of Environmental Education, 15(3): 17-24.

Leopold, A. 1949. A Sand County Almanac. Oxford University Press.

Northern Environment Directorate, Indian and Northern Affairs. 1982. A Comprehensive Conservation Policy and Strategy for the Northwest Territories and Yukon. Ottawa: Department of Indian and Northern Affairs.

Raths, L.E., M. Harmin, & S.B. Simon. 1978. Values and Teaching (2nd. ed.). Columbus, Ohio: Charles E. Merrill.

Rippey, R.M. n.d. Transactional Evaluation and the Improvement of Instruction. Unpublished manuscript, University of Connecticut, Health Center, Farmington, Connecticut.

Sakofs, M. 1984. Interpretive programming; opportunities to promote political action. Journal of Environmental Education, 15(4): 38-39.

Scriven, M. 1967. The methodology of evaluation. In R. Tyler, R. Gagne, & M. Scriven (Eds.), Perspectives of Curriculum Evaluation (AERA Monograph 1). (pp. 39-83) Chicago: Rand McNally.

Sessions, G. 1983. Ecophilosophy, utopias, and education. Journal of Environmental Education, 15(1): 27-42.

Sewell, W.R.D., & T. O'Riordan. 1976. The culture of participation in environmental decision-making. Natural Resources Journal, 16: 1-21.

Staniforth, S. 1985. Analysis of the Beaufort Sea EIA case study. Study of public participation and involvement: Mechanisms and effectiveness. Unpublished manuscript.

Task Force on Northern Conservation. 1984. Report of the Task Force on Northern Conservation. Ottawa: Department of Indian and Northern Affairs.

Trist, E. 1980. The environment and system-response capability. Futures.

Wideen, M., & P. Holborn. In press. Program and organizational change in faculties of education: Some lessons for survival. Interchange.

Wolf, R.L. 1979. The use of judicial evaluation methods in the formulation of educational policy. Education Evaluation and Policy Analysis, 3(1): 19-28. Washington, D.C.: American Educational Research Association.

World Conservation Strategy. 1980. Gland, Switzerland: International Union for Conservation of Nature and Natural Resources.

IV. F. Education in Land Information Studies: Issues, Challenges, and Potentials

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The increasing demand for land information by both the public and private sectors presents many complex challenges for local, state, and federal governments, which must expend considerable time and money to collect, manage, and disseminate a vast store of land information.

This paper discusses the issues, challenges, and potentials of education in land information studies, specifically from a case example in Wisconsin, with general recommendations at the national level.

IV. G. NSTA Searches for Excellence in Environmental Education

The NSTA Task Force for Defining Excellence in Environmental Education: John J. Padalino (Chairman), Pocono Environmental Education Center, Dingmans Ferry, Pennsylvania; Dean B. Bennett, University of Maine, Farmington; John M. Fowler, National Science Teachers Association, Washington, D.C.; William F. Hammond, Environmental Education Center, Ft. Myers, Florida; Carolyn L. Kennedy, Girl Scouts of the USA, New York, New York; David A. Kennedy, State Department of Education, Olympia, Washington; Martha C. Monroe, The University of Michigan, Ann Arbor; Walter L. Purdy, Edison Electric Institute, Washington, D.C.; Alan D. Sexton, Council Rock High School, Newton, Pennsylvania.

The National Science Teachers Association (NSTA) Search for Excellence in Environmental Education is a follow-up to the recommendation of the NSTA Task Force on Environmental Education and members of the environmental education network that met at the First National Congress for Environmental Education Futures: Policies and Practices. Their recommendation called for leaders of the NSTA Task Force to develop "desired state" conditions for environmental education and to prepare guidelines for possible publication. This panel discussed the status of NSTA's relationship to the Alliance for Environmental Education, gave a status report on the NSTA Task Force's search for excellence, and solicited recommendations from participants at the session.

EE in order to be effective depends on multidisciplinary inputs but has a strong science component. It involves "minds-on" direct contact with the environment as well as vicarious contact with the world. It involves growth in the learner from awareness and understanding to concern and action. Development and utilization of creativity and critical thinking along with values analyses are central to effective EE and are evidenced in the learner, and instructional practice, through a search for alternative solutions to environmental issues and evaluation of the ethical, social, ecological, and economic costs and benefits of alternatives.

Instructionally, this means:

providing activities and information that motivate learners to be interested in the interactions between people and the environment.

developing in the learners the intellectual tools needed for effective exploration of the world around them.

involving learners as directly as possible in investigating the world around them and their relationship to it.

fostering openmindedness and the generation and examination of alternatives.

involving learners in activities and programs that stimulate and foster creativity and critical thinking.

keeping activities and issues within the social and intellectual developmental maturity levels of the learners.

linking the science in environmental learning to other areas of human intellectual and emotional activity.

providing opportunities for the learner to be involved in working toward the resolution of environmental issues within the learner's sphere of reasonable challenge and capability. Hence, a growing sense of confidence in one's ability to positively affect one's environment individually and through group efforts is fostered.

providing information in those groups of concepts that provide awareness and understanding of (a) the living planetary system and (b) the potential our activities have for disrupting and maiming it and ultimately ourselves. More positively stated, those concepts that help us to understand how the components of our ecosystem contribute to our health, well-being, and potential for development.

The Search for Excellence in Environmental Education

In searching for excellence in EE programs, there are a number of factors to be looked at all levels of instruction. However, the degree of emphasis differs at the elementary school level from the middle/junior high, and secondary school level. At the elementary school level, more emphasis must be put on providing direct, concrete experiences with the young learners. At this level there is a need to develop basic skills in thinking, creativity, critical thinking, and other areas. At the secondary level, the emphasis shifts to honing those skills through practice, greater use of the more abstract; less direct environmental exploration can be made. Thus in seeking excellence in EE instruction, we look for those programs which:

- motivate and instruct students in the scientific underpinnings of the relationships between people and environment.

- utilize current environmental issues to illustrate the need for and use of scientific principles and investigations.

- help students see the mix of human knowledges and skills, in addition to science, that are needed to deal with people and environment interactions.

- help learners identify and investigate environmental issues of their immediate perceptual environment as well as more global issues (i.e. waste in the school, home and school energy conservation, local habitat destruction.)

- help learners identify and investigate alternative responses to environmental issues.

- involve students in examining ethical implications of the various alternative responses to environmental issues.
- regularly challenge and stimulate learner creativity and critical thinking relative to people/environment topics and issues.
- regularly provide opportunities for direct exploration of natural and built environments in a context of critical thinking and creativity.
- provide positive role models for environmental literacy, concern, and action both in and out of the school environment.
- create opportunities for student involvement in working toward responsible resolution of appropriate environmental issues including: data gathering, developing in others awareness and understanding of the issues, altering personal habits and/or behaviors to improve their own environmental impacts, expressing informed opinions to decision makers, or participating in group action to alleviate environmental disruptions.

Considering this perspective, the following criteria are provided in order to assess excellence in EE. The following checklist is provided as a tool for review of programs. The answers become a foundation for working toward excellence in EE.

The Policy Board:

- Provides a firm financial base.

The Administration:

- Encourages teachers to use school grounds, the surrounding community, and field trips regularly and frequently for instructional purposes.
- Makes teachers aware of EE in-service training programs.
- Has a local EE in-service training program in the system.
- Has EE curriculum exploration and/or development committees.
- Experiments with interdisciplinary approaches to education.
- Regularly informs teachers of new materials in EE.

- Has one or more outdoor laboratories that are used regularly for classes.

Instructional Activities:

- A number of groups explore the community in the community to learn how it functions and what its problems are.
- Opportunities are presented regularly for students to participate in environmental action projects that enhance their sense of self-worth and feeling of community involvement.
- Some classes participate in a residential, outdoor EE program.
- An EE program has been developed and implemented in/for several grades.

The School System/Education Facility:

- Has one or more people specifically assigned to focus at least half-time on EE.
- Has distributed EE guidelines to teachers.
- Encourages teachers to increase their background in environmental understanding.
- Has libraries and curriculum centers stocked with EE materials.
- Has a citizens advisory committee that recommends policies.

Guidelines for Development and Use of Exemplary EE Materials, Programs, Activities

General Considerations. Exemplary EE programs, activities, and materials should:

- Have clearly stated goals and objectives for expected learner behavior.
- Treat controversial issues fairly and honestly.
- Be concerned with helping people how to think, not what to think.
- Be sensitive to human values and avoid racial, sexual, occupational, regional, and other stereotypes.

Development of materials. Exemplary programs and materials result when:

- Instructors are involved in the developmental process and design stage.
- Clearly stated and measurable goals and objectives are established early in the developmental process.
- Materials are designed which are compatible with ongoing activities, adopted courses of study, curriculum frameworks, and guidelines.
- Allowance is made for instructor creativity and innovation.
- Materials are targeted to specific grade levels and subject matter areas.
- Materials are convenient to use.
- Tests and suggestions for evaluation are provided.

Program implementation. An effective implementation plan is needed if programs and materials are to be of maximum effectiveness. An exemplary implementation plan:

- Includes provision for instruction of those who will be using the materials.
- Makes use of services available through professional associations, institutions of higher education, state departments of higher education, state departments of education and local organizations.

Evaluation. The value of programs and materials is determined by their effectiveness. Evaluation is, therefore, a key program element and should provide for:

- The development of an evaluation design which is based on stated goals, objectives, and outcomes.
- Field testing of programs and materials in terms of stated goals and objectives.
- Continuous feedback and modification as needed once a program is underway.

Who should apply:

- Formal educators including teachers and administrators and informal educators at nature centers, residential centers, museums, and others that provide varied and sequential programs to local schools.

IV. H. Ecological Perspectives of Adaptive Community Development Strategies: Building Organizational Capacity Through Social Learning Networks

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Introduction

Water resources have historically been an issue of great concern in South-East Central Alberta. This region is part of a larger section of the Canadian Prairies which are forecasted to face serious water deficiencies in the future, unless water management programs are implemented which will balance projected demand and supply (Foster and Sewell, 1981). Variable water distribution is a major constraint to sustainable community development in this region. Water is perceived as an integral component for future growth and as an impetus for development.

In response to these conditions the Town of Hanna, Alberta, has initiated a local water management strategy as a basis for sustainable socio-economic development within the community. The two main elements embodied in this strategy are: 1) maximizing conservation in the use of presently available water supplies, and 2) supplementing existing run-off reservoir supplies, to meet present and future demands via a pipeline from the nearby Red Deer River.

Of interest to sustainable development research is the organizational process by which a locally initiated development strategy has evolved within a resource-constrained environment. This paper presents a case study of the development of a water management strategy from the perspective of a social learning process through which the community builds an organizational capacity to solve problems which confront it.

A Learning Process Approach To Sustainable Development

Progress toward a sustainable future requires researching initiatives which attempt to reconcile development with ecological imperatives (Environment Canada, 1984). Such conciliatory measures entail a transformation from the traditional view of exploitive economic development to a harmonization embodied in the concept of eco-development.

This ecological transition has 3 main requirements: 1) knowledge of the ecosystem, to create an awareness of interrelationships between natural resources and socio-economic development, 2) local involvement in planning, to build educational and training capacity for local resource management to maintain sustainable relationships, and 3) institutional linkages, to develop a resource system policy framework to support sustainable development initiatives (Bennett, 1976; Ruddle and Rondinelli, 1983; Sachs, 1980).

Rural areas facing the challenge of this transition will often find they lack the necessary resources and expertise to develop the organizational capacity for sustainable community development (Brown, 1980). What is needed under these conditions is an educational response which can adapt to resource-constrained environments (Keith and Francis, 1980). Locally initiated strategies can overcome local resource deficiencies through the development of social learning processes designed to acquire the necessary resources to build an enhanced problem-solving capacity.

The key to social learning is the formation and facilitation of organizational processes involving the participation of resource personnel in contributing to the collective knowledge of the system and in generating, implementing, and evaluating policy choices (Honadle, 1981; Korten, 1980,1981). The crux of capacity-building is an enhanced problem-solving ability resulting from the social learning process. Social learning functions as a mutual learning process which brings together resource advocates and resource users (Zaltman, 1979) through the formation of learning groups which expand into learning networks as knowledge and resource linkages are built. The ultimate goal of the process is to create a fit among beneficiary needs-organization structure-environment. Development processes which integrate resources in this manner have proven to be highly successful and sustainable (Korten, 1984; Rondinelli, 1983).

The learning process in Hanna brought the specialized knowledge and resources held by government officials, regional planners, consultants, and university extension personnel together with the less-formalized indigenous knowledge of the local community. Development of this process proceeded through 3 stages: 1) identification of local problems and development of appropriate solutions, 2) acquisition and utilization of resources to implement development strategies, and 3) evaluation of management knowledge to guide future action.

Identifying Problems and Solutions

A group of community leaders concerned with the lack of development in the region approached the Faculty of Extension, University of Alberta, for assistance in stimulating community concern and action to rectify the situation. Extension staff were instrumental in recognizing the efficacy of a community education program as a stimulus for community involvement and action on matters of community concern. Citizens knowledgeable about the region's issues, resources, and limitations are better prepared to develop innovative ideas and foster new community development strategies.

A series of regional workshops were organized involving local residents, senior government advisors, academics, private business people, and consultants for the purposes of:

1. Developing a common base of knowledge about the physical and social resources of the region, identifying development concerns, constraints to development, and alternative solutions.

2. Providing an opportunity to share concerns, information, and ideas, leading to improved communication and linkages for concerted action on innovative development strategies.

3. Creating an awareness of these issues among decision-makers and to identify appropriate organizations to which to refer for assistance in the development of appropriate strategies.

Insufficient water quantity and quality were identified as the main barriers to sustainable development in the region. As an alternative solution, a strategy of maximum utilization of existing supplies and supplementing present supplies with a pipeline from a nearby river were suggested. Such solutions are consistent with the emerging realization that this region should only expect slow, controlled growth and development in the future, and that a sustainable development strategy emphasizing quality-of-life, considerations should be stressed. Following the conference, a small interest group was formed in the community to pursue these possibilities with the appropriate government agencies.

Resource Acquisition and Utilization

Development of the water management strategy required technical and financial assistance which was beyond the means of the community. The regional planning commission, located in Hanna, proved instrumental in providing: 1) planning guidance, 2) assistance to secure and distribute conservation technologies, 3) contacts for the community to lobby senior levels of government for assistance, and 4) instituted and maintained a philosophy of sustainable development.

However, the initiative for action remained with the community. Their persistence evolved into an adaptive process of lobbying efforts and community information meetings with government officials, resulting in the development of a viable water management strategy based on existing government programs for conservation pilot projects and rural development assistance.

Funding of $70,000 was arranged for the development, implementation, and evaluation of a water conservation pilot project. The Provincial Utilities department and Environment department split 90 percent of this cost with the Federal government's Prairie Farm Rehabilitation Association, with the Town of Hanna assuming the remaining 10 percent. An identical process was instituted to obtain a further $3 million for the construction of an 18 km. pipeline from the Red Deer River, to supplement existing water supplies.

The water management strategy was developed from experiences in Canada and the United States, and consists of the following procedures:

1. Establish conservation technology.
2. Establish water rate structures and metering.
3. Establish regulatory mechanisms.
4. Establish education and information programs.
5. Supplement existing water supply (i.e., pipeline).

Evaluation

The community has displayed an enhanced problem-solving capacity in using its skills and networking abilities to evaluate past performance and guide future development. Two conferences were organized, bringing together government officials, water management experts, development experts, and concerned residents for the purpose of determining the potential impact of enhanced water management capacity on growth and development in the region. A research project for a socio-economic evaluation of the water management strategy is being developed under the auspices of the regional planning commission, to complete the evaluative process.

This research material, to be held by the regional planning commission, will contribute to the regional knowledge base and serve as guiding material to sustain the learning process, as a hedge against personnel turnover within the community. Knowledge from this process will be utilized to develop a community economic development strategy based on the limits of the water supply and other socio-economic limits operating on the community, which will be instituted into municipal and regional plans.

Summary

The following initiatives were instrumental in progress toward a sustainable future in the Town of Hanna:

1. Local initiative and involvement is crucial for developing programs responsive to local needs and resources. As a community learns to solve problems, a capacity to sustain development programs is established.
2. Linkage organizations such as planning commissions and extension faculties provide the expertise to develop and enhance local initiative through the facilitation and formation of learning networks encompassing outside resources.
3. Sustainable development initiatives were required to have potential regional application, to justify use of public funds and to facilitate innovation diffusion through learning networks.
4. Government support of innovative projects, through funding of programs stressing conservation and sustainable regional development, is essential.
5. Knowledge of sustainable development options is readily available. Developing the capacity to adapt and implement what is known, in situational contexts, appears to be the main barrier to sustainable development progress.

Conclusion

Communities can display great initiative and resourcefulness. However, they will often lack the necessary expertise to implement their ideas. Progress toward a sustainable future does not seem to be constrained by a lack of existing knowledge, but rather a lack of effective mechanisms to access, adapt, and implement appropriate knowledge when it is needed. Reciprocal social learning processes, utilizing existing organizational structures, can adapt to overcome these barriers. The social learning experience has the potential to function as a research tool among the professions, while delivering services in the community.

Evidence of the utility of this approach is starting to manifest itself in this region. Preliminary evaluation of water conservation in Hanna indicates a 20 percent residential and 39 percent business reduction in water consumption, at a projected annual saving of $10,000 in energy and chemical costs. Other towns in the region are beginning to develop similar water projects, utilizing a similar approach to Hanna. New learning groups are utilizing the contacts established in

Hanna to develop programs of energy conservation, recycling, and regional waste management.

These emerging trends had their genesis in the community learning process initiated in Hanna. These strategies represent formative attempts to put sustainable development theory into practice.

REFERENCES

Bennett, John W. 1976. The Ecological Transition. New York: Pergamon Press.

Brown, Anthony. 1980. "Technical Assistance To Rural Communities: Stopgap Or Capacity Building." Public Administration Review, 40(1): 18-23.

Environment Canada. February 1984. Sustainable Development: A Submission to the Royal Commission on the Economic Union and Development Prospects for Canada. Ottawa: Environment Canada.

Foster, Harold D. and W.R.D. Sewell. 1981. Water: The Emerging Crisis In Canada. Toronto: James Lorimer and Co.

Honadle, Beth Walter. 1981. "A Capacity Building Framework: A Search For Concept and Purpose." Public Administration Review. 41(5): 575-580.

Keith, Robert F. and G.R. Francis. 1980. "Educating People to Adjust to Resource-Constrained Economies: An Overview." In: Resource-Constrained Economies: The North American Dilemma. Ankeny, Iowa: Soil Conservation Society of America.

Korten, David C. 1980. "Community Organization and Rural Development: A Learning Process Approach." Public Administration Review, 40(5): 480-511.

Korten, David C. 1981. "The Management of Social Transformation." Public Administration Review, 41(6): 609-618.

Korten, David C. 1984. "Strategic Organization for People-Centered Development." Public Administration Review, 44(4): 341-352.

Rondinelli, Dennis A. 1983. Development Projects As Policy Experiments. New York: Methuen.

Ruddle, K. and D.A. Rondinelli. 1983. Transforming Natural Resources For Human Development: A Resource System Framework For Development Policy. Resource System Theory and Methodology Series, No.1. Tokyo: The United Nations University.

Sachs, Ignacy. 1980. "Culture, Ecology, and Eco-Development." In: J. Wohlwill. (Ed.) Environment and Behavior. Vol. 4. New York: Plenum Press.

Zaltman, Gerald. 1979. "Knowledge Utilization as Planned Social Change." Knowledge: Creation, Diffusion, Utilization, 1(1): 82-105.

IV. I. Curriculum Development for Environment Literacy

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In some ways we live in a peculiar time. We have the means and we have the knowledge to eliminate many a thing that threatens our lives or is a challenge for the environment. We are able to eliminate hunger and want for all mankind. But still these problems exist. We have eliminated the terror of many diseases from the hearts and minds of parents, and yet there is still more disease than is necessary.

Nuclear fission and fusion have advantages as well as disadvantages and it being one of the most important matters in society on a global level we have to seek adequate answers. Another issue on a global level is the danger of choking and destructive pollution. And pollution mainly because of the technical and technological advances that we have made in the war against hunger, want, and disease.

In these wars there is only one enemy; that is ignorance. We in particular as science educators have an important role to play in "facing this enemy."

These negative effects on the environment are enhanced by a number of factors. In the first place there is the high complexity of most of the environmental problems. But on the other hand there is not always the political will and we are not content with providing the current and elementary needs but are striving all along for a greater level of prosperity. Compared with other parts of the world, we might call this level of prosperity a luxury.

As we look back only one generation, we see the great progress that has been made within our society. In particular, the people of the western world are healthier than only a generation before, infant mortality is far less, we live longer, less pain-racked lives, and more useful in the sense of respect for the individual. And yet we have been acting as if we were unaware of the shadow threatening these gains. As a number of most challenging environmental disturbances, I regard:

- the pollution of our seas and the subsequent destruction of the biological systems that supplies a significant percentage of the oxygen in the atmosphere;
- the degradation of the quality of the air over our cities and forests by the presence of acid rain and other by-products of industrial activity;
- the alarming effects of the trade-off resulting from the use of dangerous chemicals meant to increase agricultural yield;
- traffic as a space consumer, polluter and causer of casualty and death;
- and, of course, our consumption of energy.

And this is not all. While we have successfully conquered many diseases caused by biological organisms, we are more and more meeting with degenerative diseases of the various body systems, such as heart and vascular deficiencies. But fortunately we also become more aware of some answers. Awareness of physical health, human biology so to speak, is an increasing trend within biology education.

As said before, the wars in essence are against one common enemy: ignorance. The weapon is education, and we are the professionals. Up to now the educational systems have by and large ignored these issues; when they have been considered at all, it has been in a conventional manner within a traditional framework.

The very concepts of environmental or ecological study has not yet enlisted the interests of significant elements of the general population. Despite the lateness of the hour, educators in general and science educators in particular are not yet fully aware of the social, political, and economic aspects of ecological and environmental problems. Until relatively recently, issues in ecology and environment had no recognizable educational parameters. Concerns about ecological and environmental issues were left to the social sciences exclusively. Now it is being recognized that the natural sciences have a crucial role in decision-making in these matters, since most of these problems result from modern agricultural and industrial processes. It is thus clear that science education must take a hand in providing an informed leadership and a public sufficiently aware to support and criticize for that leadership.

Therefore, it is clear that environmental education as all society-related issues, can only have results when it is taught in a multidisciplinary way. Exceeding the boundaries of the traditional subjects is a necessity when we deal not only with content matters but also with skills and attitudes related to the personal development of our pupils and their future roles in society.

Of course new insight and efforts don't appear out of the blue. Already in the fifties sounds for renewal in science education could be heard. But in those days our attention was directed to upgrading the content of the various sciences and improving techniques in the light of the latest advances in science and the results of studies in learning theories. Only now have we become aware of the intermittent connection between science and education on the one hand and society and technology on the other.

This work is not only important for the near future but maybe even more for the future generations. And therefore it is hopeful to ascertain that young people take a growing interest in environmental matters.

A good example of a school based environmental project is that of the European Community. The European Community recognized this issue some seven years ago with the establishment of an environmental educational network for primary education, and more recently a secondary network. The establishment of the 50 schools project demonstrates that the E.E.C. is embarking on new paths in curriculum development because it maintains close and continuous contact with the most important units in education, the teacher and the classroom with students, in primary as well as in secondary schools.

When the Environmental Education Network of the European Community was set up in February of 1977 two principal aims were proclaimed. These goals are still important and relevant.

- to enhance the quality of environmental education in the pilot schools through mutual cooperation and learning from each other's experience; and
- to collect, test, and disseminate environmental education materials.

Many interesting and good things are going on in the schools of the European Environmental Network, but in my view there is a weak point, a black hole, so to speak. A matter which is, in my opinion, crucial to any lasting curriculum development but which is too often neglected is teacher training. How important the implementation is of the people who have to realize and materialize the educational ideas and concepts mostly is underestimated or at least not so much affected. It must be a challenge for all curriculum work in environmental education to avoid the drop-down effect of many a science project in the seventies, so that good ideas and materials won't remain on the doormat of the schools.

Education has always been concerned with literacy, numeracy, and lately of course computer literacy. The ecological and environmental problems that we face and of which we have lately become quite concerned about, can only be solved by a new kind of literacy. Is it not the high mission of educators interested and working in the field of environmental education to develop environment literacy for tomorrow's world?

This does not mean more scientific knowledge for students and teachers, but dealing with skills and attitudes we have rarely focussed in education so far. If we want science education to be more related to our societies and future human needs, we have, among other things, to deal with the ideas of other disciplines and develop and teach in a multidisciplinary way. It also means that we have to base education on overruling principles, a vision on man and society and pedagogical starting points. By the complexity of so many issues and problems in society our main concern, more than ever before, has to be that the children we educate today will be the decision-makers of tomorrow.

IV. J. A Study of Federal Efforts at Curriculum Intervention: The Environmental Education Act of 1970.

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By the time the Federal Government legislated environmental education in 1970, it had become deeply involved in educational reform legislation and legislation to correct environmental pollution.

Reform Era

Atkins and House, Wert and Quick, Sykes and other researchers of public policy in education have traced the educational reform activities of the Federal Government between 1950-1980. They have called this era the Reform Era. The reform agenda of 1950-1965 responded to concerns about national security. The 1965-1970 reform legislation responded to equity issues. The goal of the reform legislation was to use education as a strategy to bring about social reform. After 1970, Atkin and House claim that special interest groups exerted increasing political influence on Congress. The result was policy fragmentation, as more and more educational intervention programs met the needs of smaller and smaller populations.

The Nixon Administration pressured for reduction of funds for educational reform by reducing funds for categorical grant programs. This trend continued through a number of administrations and led to the decentralization legislation, the Education Consolidation and Improvement Act of 1981.

At the time of the introduction of the Environmental Quality Education Bill to Congress in 1969, Federal intervention in education was perceived to be an appropriate means for bringing about social reform.

The Environmental Movement

During the previous decade, pollution warnings had been voiced in literature by such authors as Rachael Carson in Silent Spring and Stewart Udall in The Quiet Crisis. Public figures from the media and politics also contributed to public awareness. Arthur Godfrey, a popular daily radio figure, spoke and wrote extensively about pollution. He subsequently testified at the 1973 House hearings to renew the Environmental Education Act. Media coverage of environmental degradation intensified, providing considerable foundation for public attention of the growing environmental problem. A number of environmental disasters had occurred which heightened the public awareness of environmental deterioration. The Santa Barbara Oil Spill and the burning of the Cuyahoga River in Cleveland were mentioned repeatedly in the literature.

As public concern spread, the Federal Government legislated a number of laws to clean up and preserve the environment. The National Environmental Policy Act and other laws were enacted to enforce governmental and private-sector action for environmental quality. The Environmental Education Act may be considered such a law.

The Environmental Education Act

A review of the Congressional Hearings prior to the passage of the Environmental Education Act reveal that the majority of those testifying were professionals, well-educated people who were concerned about environmental degradation. They represented a cross section of the educated public. During the Senate debates over the bill, Senator Gaylord Nelson mentioned the national teach-in on the environment as an expression of public support. Congressman John Brademas, in a 1971 analysis of the passage of the bill, implied that Congress was taking a leadership position with this legislation. Although the fundamental issues of public support and educational accommodation were unresolved, the sponsors of the bill apparently impressed Congress with the importance of this issue.

They justified the Act on the basis of an abstraction on the classical argument of national security. They used the argument that a degraded environment posed a threat to human survival and to the quality of life. The enemy, in this case, was pollution and human practices that compromised the ability of the earth ecosystem to continue to support the current quality of life. They did not introduce the world issues that presently dominate environmental education; rather, the arguments were limited to national interest.

The sponsors introduced twin bills simultaneously into both Houses of Congress. The format for the bills was the same as Drug Abuse Education Act that had passed into law in 1969. The bills were introduced in Fall sessions assuring sufficient time for floor consideration and maneuvering. The sponsors were in a position to assure that the bills passed quickly through key committees. They monitored the negotiations between both Houses of Congress.

The categorical grant was used as a funding method, a common strategy for reform legislation. They did not ask for large sums to institutionalize the Act. The Act was to be managed by the Office of Education under the Department of Health, Education, and Welfare, a common agent for reform legislation. This avoided arguments over funding, agency domain and from those who would argue against a federal presence in schooling. On November 16, 1970,, the Environmental Education Act was signed by Congress. It became Public Law 91-516. It is interesting that Mr. Brademas and Mr. Nelson continued to shepherd the Act for most of its tenure.

Tenure of the Act

From the outset, there were chronic problems with the Act, the specifics of which are too numerous to detail here. They fall under two main catagories, management and budget.

The allocation of funds by Congress and the appropriation of them by the Office of Management and Budget were never sufficient for the fulfillment of the Act. The Office of Education delayed instituting the Act. They delayed forming the Office of Environmental Education (OEE) and the Advisory Council. Without them, there was a delay in establishing criteria for grants, processing, and supporting them.

Once established, the OEE and the Council had difficulty working together. The small office staff was over-committed and concerned about maintaining control over decisions. The 21-member Council had diverse backgrounds which made it difficult for them to operationalize environmental education. The members had an interest in environmental matters but there appeared to be little common knowledge or sets of fundamental precepts with which to begin decision making about the complex issues of environmental education. They represented fifteen states, making it necessary for them to travel long distances to meet. They formed committees that were unable to meet informally. The committees lost members and it was questionable whether they communicated with each other effectively.

Subsequent reports to the Office of Education in 1973 and 1977 mentioned dissatisfaction with funding and administration, communication and cooperation with OEE, leadership, and representation at meetings. They expressed concern about the amount and duration of the grants as well as technical assistance, dissemination, and evaluation.

By 1978, the Council was disbanded and the Act was renewed for five years under HR 15, the Elementary and Secondary Education Act extension, Title III--Special Projects. Title III programs were consolidated under Chapter Two of the Education Consolidation and Improvement Act of 1981.

Discussion

On the surface, the Environmental Education Act was a typical example of reform legislation that was popular between 1950-1970. Its funding, structure, managing agency, and belief that education could bring about change in longstanding social problems were similar to others of that period. It was more sophisticated in that it defined education on broader terms and adopted a strategy that justified social reform using national security arguments. Although it had its own management difficulties, it met with the same demise as other categorical grant programs.

The subtle difference in this Act has to do with its reform agenda. Other Acts addressed singular issues, such as drug abuse, access to equal educational facilities, and improvement of reading skills. These programs had specific goals and expected outcomes, e.g., prevent drug abuse, movement of a small population into the mainstream of socio-economic opportunity or to create a better reader. The Environmental Education Act asked for consideration of society's relation to many of its institutions and subsequent changes in society's attitudes and behaviors toward natural and man-made environments. However, the expected goals and outcomes were not detailed. At the time of the legislation, the implications of this were not discussed.

The Act asked for a significant change in the way schools did business. When it advocated interdisciplinary curricula and a central definition of what it was to consider, it was asking a decentralized school system to reorder some of its curriculum according to centrally defined criteria.

The Act expected environmental education to "reflect man's role in the environment and the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment" (The Act). Energy was added in 1978.

By legislating equal importance of this environmental paradigm to those school subjects that had evolved as a function of the resident culture, the Federal Government was implicitly asking schools to be agents of social reform, a role they are ill-fitted for. The outcomes were predictable. Although the Act supported numerous curriculum projects throughout its tenure, some of them very creative, the Act was not instrumental in institutionalizing environmental education in the public schools.

Although the Environmental Education Act met its demise for some of the same management and budgetary reasons as did other reform legislation, there is a lingering question about feasibility of its reform agenda and the ability of public schools to accommodate its expectations.

On the positive side, the informal education mentioned by the Act is most active today. There is considerable educational activity in grass-roots organizations, in other Federal agencies, on the international scene, and on public television. It is within these efforts that the environmental paradigm is being defined and debated. It is impossible to relate their activities directly to the Act. The consensus of environmental educationists is that the legislation was a statement of Federal awareness and may have stimulated some very good projects.

V. International, Global and Third-World Concerns

V. A. The International Society for Environmental Education: A Global Strategy for the Biosphere

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Now more than ever before, the issues of economic well-being and environmental liveability have become one. Extremes of environmental degradation--erosion, deforestation, desertification, acid rain, toxic wastes--threaten the very resource base upon which the economic aspirations of industrialized and developing societies alike depend. Economic development is the only hope for a better life for millions of people. If anything, the words of Indira Gandhi, "Poverty is the worst form of pollution," are more true today than when first uttered at the 1972 UN Stockholm Conference.

Perhaps nowhere is the worst case scenario of the Earth's future more starkly revealed than in the twin tragedies of northeast Africa--environmental destruction and economic collapse--and the attendant fate of millions of people. So disastrous is this situation that the Worldwatch Institute State of the World 1985 report suggests that unwise land use patterns have adversely affected rainfall, thus intensifying drought.

Advocates of economic development and environmental protection have been adversaries for decades. In spite of noble purposes and increased knowledge, environmental educators, to paraphrase the Director of the United Nations Environment Program, K. Mustafa Tolba in 1982, have made very little progress in influencing political and economic decisionmakers.

The International Society for Environmental Education represents a new approach. First and foremost, ISEE is committed to environmental education based upon analysis of both ecological and socioeconomic imperatives and communication with decision makers to promote ecologically sustainable development.

Second, ISEE proposes to overcome the frequent isolation environmental educators experience by creating a global communications network of individuals and organizations. In addition to quarterly publication of The Biosphere newsletter, ISEE is organizing workshops in each major region of the world to disseminate the integrated ecological/cultural concept and to nurture grass-roots professional involvement. Such workshops have been held in New Delhi, India, and Lake Louise, Canada, since June 1984 and are planned for Africa, Latin America, and the Middle East in the near future.

Third, ISEE seeks funding from corporate, foundation, and government sources to support a variety of environmental education projects. In association with the World Council for the Biosphere and affiliated organizations, ISEE assists the development of curriculum materials, serves as a clearinghouse for information exchange, and provides expertise for establishment of environmental education programs.

ISEE's formal statement of mission and objectives was adopted in June 1985, during its second annual meeting at Sonloup, Switzerland:

Statement of Mission and Objectives

I. Mission

The International Society for Environmental Education (ISEE) is an association of individuals and organizations engaged in the practice of environmental education, communication, and research to promote ecologically sustainable development. The ISEE seeks to increase the effectiveness of environmental educators in fostering an understanding of the Biosphere and the concepts, skills and attitudes needed by an environmentally competent global citizenry. To achieve this mission, the following objectives are set forth:

II. Objectives

- to increase awareness of the Biosphere and global development issues;
- to establish a network of environmental educators;
- to promote research and communication related to environmental education;
- to promote and conserve social, cultural, and ecological diversity;
- to foster communication between conservation and development interests;
- to incorporate environmental concerns in development decision-making;
- to coordinate the activities of ISEE in a supportive and complementary manner with other organizations interested in environmental education.

ISEE delegates were in the forefront of adoption of the so-called Delhi Declaration 1985, a series of resolutions on environmental education approved at the Second International Conference on Environmental Education, March 4-9, 1985, in New Delhi, India. The Delhi Declaration has special reference to circumstances in the Third World, but contains ample wisdom for environmental education for the globe as a whole:

1. National Environmental Education Associations should be established in developing countries to serve the professional needs of environmental educators; to create linkages with government, business, and non-formal education; and to assist in development and dissemination of curriculum materials.

2. University teacher training programs should provide significant training in environmental education. Only when environmental education assumes a central place in all education will it begin to influence environmental management and policy. Such training should include scientific and cultural studies related to human activity and the environment.

3. Each nation should consider establishment of a Youth Environment Corps. Consisting of youths aged 16-25, the Corps would work on projects which promote ecologically sustainable development, especially in rural areas. Youth Corps projects should provide environmental knowledge and skills for participants in the program.

4. Environmental education councils should be established at the local level, composed of local residents, officials, farmers, businessmen, and local directors of various environmentally-related projects and programs. Such councils would serve in an advisory capacity to assist in implementation and legitimization of programs at the local level.

5. Environmental education demonstration projects should be established at the local level in concert with economic development projects to demonstrate the benefits of such a partnership. Such projects are necessary to gain local support for environmental education and to provide a working model for ecologically sustainable development.

6. The International Society for Environmental Education should establish a global EE communications system to disseminate information monitoring such indicators of the biosphere's environmental quality as soil erosion, fresh water availability, food production, energy utilization, population growth, pollution loading, rates of deforestation, rates of desertification, and levels of soils salinization.

7. Environmental educators must develop practical pedagogical methods which demonstrate information being communicated and apply content to problems of environmental health in daily life, e.g., clean drinking water, appropriate waste disposal, proper sanitation practices, as well as provide concepts and values regarding human-environment relationships.

8. Environmental Education curricula should be reviewed and, where appropriate, revised to provide inclusion of scientific and cultural (humanities, politics, economics) content sufficient to insure that students understand the scientific basis of environment and ecology and the organization and processes of human society. Without this scientific and cultural understanding students are unable to develop a useful holistic perspective for effective citizenship and professional life.

ISEE's immediate future points toward a global environmental education conference. "Tbilisi plus 10," which the Soviet Union has agreed to host in 1987. This conference will assess progress in environmental education since 1977 when the first Tbilisi international conference was held. The ISEE strategy for the next two years is to promote local and regional conferences all over the world to inventory and analyze existing programs and produce models and recommendations for consideration on a global scale at Tbilisi.

The 1986 NAEE Conference in Eugene, Oregon, September 12-17, will serve as a regional gathering for North America. Plans are being discussed to include a significant assessment of what environmental education in North America has accomplished in the past decade. Where appropriate, paths will be charted for new EE directions. As well, the proposed theme, "Environmental Education: Transition to an Information Age," suggests a review of environmental education in light of a future of computers, robotics, and bioengineering.

Environmental Education's role in the educational transformation to the Information Age represents an exciting new era. Because the computer revolution, based on the technology of the microchip, promises fundamentally to alter energy, resources, and waste cycling processes through the economic system, significant changes may be in store for the messages of industrial waste, depletion, and pollution that have been bywords of the EE creed since the 1960s. ISEE's commitment to rigorous scientific and cultural studies as the basis for environmental education may yield important new insights for an EE reformulation.

ISEE seeks to establish a global network serving EE professionals, but reaching out to communicate with and to influence businessmen, politicians and citizens in the effort to promote ecologically sustainable development. ISEE gives significant attention to cultural as well as ecological factors and emphasizes the preservation of cultural traditions that foster positive environmental values. Education and action at all levels--local to global--seems necessary to move environmental education closer to the center of all education.

V. B. The Slum Environment in Third World Cities-A Problem in Human Ecology (Manila, Phillipines-A Case Study)

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Introduction

Every culture and society, particularly in the developing world, is troubled by the persistence of slums and squatters in its urban environment. Although the prevailing view is that the slum is a transitory phenomenon which will somehow disappear as the economy progresses, the forecasts read that slum settlements are expected to double each decade. Today, approximately one third of the world's population live in slum housing conditions (Etherington, 1973). By the year 2000 more than half of the world's population will be living in cities, which further implies that the poor housing conditions are expected to worsen (Douglas, 1983).

Several development plans and policies for slum improvement have been formulated and implemented. But many such efforts have largely failed (Angel, 1983). We thus see a future presenting a more intensified problem in slum growth. What seems to be the problem is the lack of a better understanding of the slum environment.

This paper is about the slum environment and the central issues that affect its inhabitants. It is written with two purposes in mind. The first is to present and discuss the current slum improvement activities of the World Bank, with the Philippines as a case example. Second, is to suggest an environmental-oriented strategy for housing program evaluation. The approach is designed to elevate housing programs to a level where evaluation is conducted within the context of its cultural, political, economic, natural and built environment.

The World Bank Efforts to Solve the Housing Dilemma in the Third-World Cities

A significant development in third-world housing in recent years is the introduction of shelter programs supported by the World Bank. The year 1975 marked the turning point for urban shelter development in many third-world cities (Housing, 1975). Housing for low income groups has become a principal thrust. New solutions offered by the bank are the most common issues related to urban housing.

By the end of 1981, 62 projects had been approved, amounting to approximately two billion dollars in lending (Cohen, 1983). The projects were implemented in Africa (Botswana, Egypt, the Ivory Coast, Kenya, Morocco, Senegal, Tanzania, Upper Volta, and Zambia), Asia (India, Indonesia, Korea, the Philippines, and Thailand), and Latin America

(Bolivia, Colombia, El Salvador, Guatemala, Jamaica, Mexico, Nicaragua, and Peru).

The major challenge to the Bank was to assist borrower countries to develop projects that could be successfully replicated. To achieve this goal, the shelter projects initiated differed widely from previous government approaches. The basic difference was in redefining the criteria for appropriate housing. A new model called the Progressive Development Model was introduced (Keare, 1983). The concept of progressive development suggests that the pace of improvements will depend on the income and preference of the residents. Through the provision of secure tenure and basic services, the bank perceived that low-income households can be encouraged to improve their housing through self-help finance and construction. Formally defined, the progressive development model is "a method of housing construction or upgrading achieved through staged development, flexibility in housing design, and the use of self-help components" (Keare, 1983). The model is premised on the concept of affordability as a design factor.

The Progressive Development Model abstracts those components of the urban environment that are considered essential in decision-making. Planners solve the economic problem by understanding or controlling the economic aspects of the urban housing situation. For instance, affordability of housing to the lower income bracket was the principal justification. The World Bank appraisal reports always included affordability estimates. The questions we should then ask are, "Were the projects really affordable? Does the assumption bear any relation to the existing realities in the target areas for upgrading?"

Despite the Bank's conclusion that the Progressive Development Model is a realistic way of helping the poor, there are manifestations, specifically in Manila, Philippines, that the model has not been quite successful in providing decent and affordable shelter for the intended low-income beneficiaries. The project uproots people from their habitat and incurs environmental risks with the imposition of reduced construction standards intended to minimize development costs (Coronel, 1984) (See Table 1).

PROBLEM	CHARACTERIZED BY	RESULT
Economic Problem	construction of shelter not affordable to intended users.	slow cost recovery massive gentrification-lower to middle class.
Socio-Cultural Problem	mass uprooting through forced eviction without a reasonable alternative offer.	mass unrest return to urban center increased poverty.
Construction/ Design Failures	flooding, clogged sewage systems, natural disturbance lack of basic amenities.	environmental deterioration reduced standard of living.

TABLE 1. Negative Impacts of World Bank Low - Income Housing in the Philippines

Economic Problem

The Philippine Housing Policy has progressed from slum removal and relocation to one of slum upgrading, but is again falling back to forced eviction and relocation (Makil, 1983). The reason for the retrogression is quite clear: the people cannot afford the housing project. This fact was not earlier realized because estimates made were based on income distribution data that were not reliable and assumptions about the percentage of income the urban poor are willing to spend might not be accurate. In the Philippines the Bank's Housing projects were investigated by a West German expert who said that 60 to 70 percent cannot pay the rental because this population still lives below or near the starvation level (Oberndorfer, 1979). Hence, it is unlikely for them who lack even the most basic need for food to be able to afford the cost of housing. In reality, therefore, there could never be full cost recovery if the poor are expected to pay. For the Bank to ensure full cost recovery, it appears that the urban poor could not be the target population of the projects.

Cultural Problem

Urban land is the most valuable resource among the urban poor because it is close to employment centers and health and educational institutions. When forced to move out to some distant site, disturbance occurs affecting all economic, socio-cultural, and physical networks. This disturbance is not a case of mere incompatibility with new locations. Rather, the issue here is survival. As one observer has said, "Squatters return to the old or other sites near the urban center not because they are defiant. They leave the relocation sites for exactly the same reason that they squatted before--they want to survive. Relocation sites do not offer opportunities for a better quality of life. The fact is that the life they were made to leave behind is twice better than what they are being made to face" (David, 1982).

Design and Construction Problems

In the developed sites within the urban center, residents question the quality of physical improvement in the area. During a meeting with the National Housing Authority, one representative of the community organization said, "Our sewers are clogged because the pipes installed were of inferior quality. When it rains, our streets are flooded and the whole community becomes a murky swimming pool for our children" (Resident, 1984). Prior to the projects, flooding never occurred in the area. Flooding began when one of the major water tributaries was filled to make way for the construction of a major road.

The provision of housing for the inhabitants of slums is a difficult problem that will not be solved overnight. I see the concept of "affordability" as a necessary part of the solution, but only a part. We must see other important factors that affect the feasibility of housing for the poor. For instance, it is necessary to increase the productivity of the slum dwellers so that the cheapest housing can be within their reach. More attention must be given to learning about the people, the setting and the contextual nature of the environment. We must also worry about the effects of the projects on the culture and the natural environment. We must change our idea that worrying about environmental impacts is a luxury they cannot afford. Many cultural and environmental problems caused by the housing projects (both sites and services and slum upgrading), such as flooding, lack of water, and food source, all determine human survival and the viability of the projects.

I have presented an overview of the World Bank's housing program and commented on some of the central issues that affect the housing conditions in the Philippines. What the Bank will do next and where their programs are headed is uncertain. At this stage, it is critical that we increase the influence of evaluation in World Bank housing programs. This will clarify the true scope, cost effectiveness, practicality and availability of housing for the urban poor. There are many ways to do this. The discussion that follows will suggest a general strategy for housing program evaluation.

The Need for an Environmental-Oriented Strategy for Housing Program Evaluation in Third-World Cities

Because of the nature of the slum population, the design, the cultural and environmental issues affecting the slum settlement, and the type of problems posed, I suggest an environmental-oriented strategy for the evaluation of current housing programs. Evaluation is one important component of successful housing programs. It ascertains that housing beneficiaries are provided with shelter and services directed to their needs.

An environmental-oriented evaluation concerns itself with understanding the relationship between people and the environment and its implications for the quality of life. Such an evaluation can help address important questions such as: What elements in the slum environment are most important to people? Why is the place preferred over new housing projects? How do they maximize the use of space? How do they feel about the visible environmental problems around them? How would they design their own environment given the resources needed? What features in the slum environment facilitate productivity, a sense of contentment, a sense of helplessness, etc.? These questions and many others are important yet they have been given very little attention in housing research. The task of shaping and manipulating the environment to achieve better quality must first consider obtaining all this and more pertinent information (Appleyard, 1972).

The evaluation of low-income housing projects must be interdisciplinary. The slum cannot be evaluated solely by economists, whose perspective of the problem is devoid of many human and environmental values. An economist may know all about housing finance and factors that enhance economic productivity, but may not be aware about the psychology of the urban poor or the mechanisms by which they adapt to adverse urban conditions. Through environmental-oriented evaluation of the slum environment, an interfacing of disciplines may be achieved to better the relations among the various facets of the slum environment.

Environmental-oriented evaluation methods help in identifying the essential components in the slum environment. It also helps determine the mutual interdependencies and adaptive mechanisms devised through the interaction of its components. Many disciplines can contribute toward a better understanding of the slum environment given the environmental-oriented evaluation approach, and the major attribute that the disciplines share is the employment of scientific methods in collecting data. But this is only one consideration. The most important is to respect the great store of information that is provided by the reactions of the users themselves. This is an effort and an opportunity to combine the insights of the behavioral scientists, the planner/designer, the policy-makers, and the ultimate receiver, the residents of the slum environment.

Conclusion

The housing program of the World Bank has consistently asserted that it is possible to provide secure and environmentally sound shelter to members of low-income groups, within the constraints of the amount of their incomes. The experience of the Bank in promoting this assumption, however, shows that there is obviously much more to be learned. The importance of an environmental-oriented evaluation and the development of new ideas is stressed. This will provide the guidance needed for future development and modification of existing housing policies and programs.

What I have presented serves only as a leverage point for future research on the slums. The concept is important where new knowledge about slum improvement is being sought. Its value lies in providing a new look at the slum environment. An environmental-oriented evaluation is the kind of method we need for exploring, broadly and in depth, new areas which could have a profound effect on the slum environments in the immediate and long term future.

REFERENCES

Angel, S. and Stan Benjamin. 1983. Seventeen Reasons Why the Squatter Problem Can't Be Solved. In Webster D. (ed.), The South East Asian Environment. Ottawa: University of Ottawa Press, pp. 49-60.

Appleyard, D. 1972. The Environmental Quality of City Streets: The Resident's Viewpoint. AIP Journal. 38(2), pp. 84-101.

Cohen, M. 1983. Learning by Doing: World Bank Lending for Urban Development. World Bank, Washington D.C., pp. 1-55.

Coronel, Edmund. 1984. What Price Development for Squatters? Mr. and Ms., 2(9), pp. 32-33.

David, K. 1982. Wretched of the Earth. In Concerned Citizens for the Urban Poor Series No. 2. Manila: NASSA Pub. pp. 1-32.

Douglas, I. 1983. The Urban Environment. London: Edward Arnold Pub, pp. 1-17; 161-65.

Etherington, A.B. 1973. Facing the Squatter Problem in Developing Countries. Solidarity 8(1), pp. 1-13.

Housing. 1975. World Bank Sector Policy Paper.

Keare, D. and E. Jimenez. 1983. Progressive Development and Affordability in the Design of Urban Shelter. Working Paper #560. World Bank, Washington, D.C., pp. 1-55.

Makil, P. 1983. Slums and Squatters in the Philippines. CCUP Series No. 3. Manila: NASSA Pub. pp. 1-42.

Oberndorfer, Dieter. 1979. Some Observations on the Low-Cost Housing in Tondo Foreshore/Manila Financed by World Bank. Freiburg. p. 5.

Resident (Tondo). 1984. From A Speech before the National Housing Authority Officials.

V. C. Population Education - Teaching About a Sustainable Future

Patricia Cancellier, Population Reference Bureau, Washington, D.C.; Deborah Brouse, Zero Population Growth, Washington, D.C.

The workshop focused on participatory activities which will help educators understand and teach about world and U.S. population trends, the effect of population growth on world resources, and the importance of population dynamics in planning for a sustainable future for the world.

V. D. The European Experience of Cooperation in Environmental Education.

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V. E. Nature Education by the Bombay Natural History Society

Shailaja Grubh, Bombay Natural History Society, India.

Nature Education has been an important conservation activity of the Bombay Natural History Society for over three decades. The major aim of the scheme is to imprint nature appreciation in the minds of school children so that as they grow they would support the cause of nature conservation and wise use of natural resources. The Society's Nature Education

Scheme financed by the Government of Maharashtra State has been so far confined to the State of Maharashtra, particularly the city of Bombay. Since we began the Nature Education Scheme, it has been possible to educate on an average 4000 students every year in nature appreciation.

Major Programmes

Nature Education is undertaken through field trips to areas of natural history interest; through the study of exhibits at the natural history museum and live exhibits at the aquarium and the zoo; through exhibitions, drawing and essay competitions and wildlife quiz programmes, talks, film shows, articles on wildlife in newspapers and magazines radio programmes and publications of low priced nature booklets. In addition, nature orientation courses for biology teachers and teacher trainees form an important part of the programme.

Field Study

Natural history outings are usually arranged at the Sanjay Gandhi National Park, a 105-sq-km nature reserve commencing within the Municipal limits of Bombay city, and Karnala Bird Sanctuary, approximately 90 km off Bombay. The Bombay hinterland also has several other areas of natural history interest. The field study trips are for students of the age group 13 to 17 years studying in VIII to XI standards at school. The size of a group is usually from 25 to 30 children, with an attendant biology teacher. In an academic year approximately 40 such field outings are arranged, and about 1000 to 1200 students are exposed to field natural history through these outings and get to recognize our common song birds, trees, seasonal plants, insect life and nature in general. The field trips end with a group discussion of the points of interest noted.

Overnight camps were usually held for under-privileged school children who would not otherwise ever have an opportunity to experience living close to nature.

These field trips have provided abundant evidence that the lack of interest in nature shown by young and grown-up people in India of current and earlier generations is largely due to lack of exposure to nature and its importance in human ecology.

One of our crucial programmes is the nature orientation courses arranged for biology teachers, as well as teacher trainees. Apart from lectures and field trips, projects are also undertaken. A freshwater pondlife cum-aquarium project was very successful for teaching techniques to biology teachers. Aquatic habitats and adaptation of plant and animal life to aquatic habitats were demonstrated in nature, as well as in the laboratory, and a practical demonstration on setting up a fresh water aquarium was also given.

The objective in organizing such courses and projects is to convert teachers first into nature lovers so that the message of nature appreciation can be spread faster and more intimately by the teacher in the minds of impressionable children.

Nature Education Through Exhibits

This method of teaching relied on visits to the aquarium, the natural history section of Museum and the live exhibits at Zoo in the city of Bombay. Usually, smaller children of the age group 10 to 13 years studying in V to VIII standards were taken around. The children are able to learn details of the physical characteristics of wildlife which otherwise cannot be approached at close quarters. Lessons on visits at the Zoo include understanding animal life as well as getting to know common trees and flowering plants maintained in the garden at the Zoo. The annual programme of 12 to 15 visits to the Museum, Zoo, and Aquarium exposed about 2000 students to the study of nature every year.

Exhibitions, etc.

Wildlife exhibitions for school children are usually arranged during the first week of October, which is named as Wildlife Week by the Government. The themes for such exhibitions are usually ´Conservation of Wildlife´ or ´Glimpses of our Wild Heritage,´ ´Sanctuaries of India,´ etc. These exhibitions attract a large number of students, often in thousands. In addition, the Society holds snake exhibitions which are educative not only to students but also to the general public. Advice and assistance is also given to colleges and schools for organizing nature exhibitions.

Competitions

Wildlife essay and painting competitions and quiz programmes enable us to reach out to more children interested in nature. Such competitions also plant the seed of nature conservation not only among children but their parents also.

Publications

One of our major endeavors has been the publication of low-priced, attractively illustrated booklets on common birds, mammals and plants. These are published in regional languages in addition to Hindi and English. The series provides handy field reference for students.

Radio talks, etc.

On a wider panorama education through radio talks and articles in newspapers cover a much larger audience. The feed back we receive shows that a number of people who are otherwise not committed to the cause of nature have become so by reading newspaper articles and radio talks on wildlife and nature.

Conclusion

We find that students greatly benefit from the field trips and from the visits to the Museum, Aquarium, and the Zoo. Many schools feel that they could have used more days for such activities, as only one class can participate at a time in our different activities in a year.

What we have done so far under the nature education scheme is meager as compared to what has yet to be done, particularly if we look at the sheer gigantic statistical scenario of education in India. We have today half a million primary schools, 120 thousand middle schools, 53,000 secondary schools. These cater to literally 120 million students. Most of these students have negligible exposure to nature, as environment forms a small portion in their tightly scheduled biology syllabus.

Our major problem has been our inability to be more positively effective from the lack of staff. The work done so far is by one Nature Education Organizer. Additional staff would enable us to reach more school children and teachers and the general public through expanding and intensifying the existing activities as well as incorporating additional programmes such as preparation of permanent and mobile nature exhibits, publishing informative charts on birds, mammals and a nature magazine for children as well as preparation of a natural history syllabus for schools and training colleges.

V. F. Automobile-Dominated Large Cities: A Non-Sustainable Urban Form In Developing Countries.

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Introduction

Population growth and urbanization have been recognized as major trends in the literature on global ecology and sustainability.[1,2,3] Although the spatial extent of urban areas in terms of percent of land area is relatively insignificant, environmental conditions within and immediately surrounding urban areas are critically important because they support large populations. As shown in Table 1, it is estimated that over 50 percent of the world´s population will be living in urban areas of one million people or more in the year 2000.

Table 1. Population and Number of Cities in a Particular Size-class, 1975-2000 (population in millions).

Size-class (millions)	1975	1980	1990	2000
	More-developed Regions			
Urban Population	767	834	969	1092
4 million +	121	142	171	207
Number of cities	13	16	19	25
2 - 3.9 million	72	73	99	96
Number of cities	26	27	36	36
1 - 1.9 million	77	99	119	131
Number of cities	56	74	89	94
	Less-developed Regions			
Urban Population	794	792	1453	2116
4 million +	121	170	295	535
Number of cities	17	22	33	61
2 - 3.9 million	61	82	144	183
Number of cities	22	31	50	69
1 - 1.9 million	73	87	157	213
Number of cities	51	65	115	154

Source: Reference 3

In response of this concentration of population in urban areas, a reasonable question to ask is whether the urban areas are sustainable. Investing billions of dollars into environmentally or economically non-sustainable urban areas would be a disastrous mistake. The question of urban sustainability may not have been sharply focused in the global sustainability literature, in part because urban areas constitute such a small spatial extent and governments are perceived as relatively helpless in stemming the rate and location of urbanization. However, progress toward a sustainable future requires explicit consideration of the sustainability of critical components of the global ecosystem. Large cities are one of these components.

Transportation and Urban Form as Challenges to Urban Sustainability

The sustainability of urban areas in challenged by numerous factors such as water supply, sanitation, shelter, and food. The specific threat to sustainability addressed here is the development of urban forms in conjunction with, and dependent on, high levels of motorized travel. The threat is based on two distinct problems, air pollution and related health impacts, and energy availability and cost to operate the transportation system.

The basis of the problem is reasonably well understood. As urban areas expand, available land is generally at the edges of urban areas or in steep topography previously considered unsuitable for habitation. As distances from the city centers and other major travel attraction centers increase, there is increasing need for motorized travel to supplant the traditional modes, walking and various bicycle forms. This need is usually exaggerated by the marked decrease in population densities in the fringe areas as urban areas expand in both industrialized and developing countries.[9]

The evolution of the form of urban areas is associated with other factors such as the growth of income which is accompanied by changing travel habits and the acquisition of motor vehicles. While the proportion of middle and upper class individuals in developing countries is far lower than in industrialized nations, the number of automobiles and motorcycles can be in the millions. Mexico City had 1.5 million motor vehicles in 1980.[10] The travel patterns of the upper-income population are not so unlike their counterparts in industrialized countries. The consequences are 1) increasing congestion as existing transportation infrastructure is overwhelmed, 2) air pollution which increases more than proportionately relative to vehicle kilometers due to decreased operating speeds, and 3) increasing demands for energy. The long-run consequences are more ominous, for not only do these problems become more severe, but urban areas become locked into a dependence on motorized vehicles. Urban settlements are too expensive to abandon, or significantly alter, on any large scale.

Private motor vehicles, automobiles and motorcycles, present a particularly difficult problem in that while they may accommodate 40 percent or less of passenger-kilometers in many major cities of developing countries, their sheer numbers clog roadways and thus effectively reduce the capacity of public transit such as buses, trolley cars, jitneys, minibus, etc. to operate. In some cities, such as Jakarta, bicycles and peddle taxis (becaks) are prohibited on streets, to accommodate motor traffic.

Air Pollution and Energy Consumption in Mexico City and Jakarta

The evolution of major urban areas towards potentially non-sustainable conditions is demonstrated by the cases of Mexico City and Jakarta.[5,6] As shown in Table 2 from the

Global 2000 Report, these cities are expected to be among the largest urban agglomerations in the year 2000.

Table 2. Estimates and Rough Projections of Selected Urban Agglomerations in Developing Countries

	1960	1970	1975	2000
Mexico City	4.9	8.6	10.9	31.6
Calcutta	5.5	6.9	8.1	19.7
Greater Bombay	4.1	5.8	7.1	19.1
Seoul	2.4	5.4	7.3	18.7
Jakarta	2.7	4.3	5.6	16.9
Greater Cairo	3.7	5.7	6.9	16.4
Karachi	1.8	3.3	4.5	15.9
Delhi	2.3	3.5	4.5	13.2
Manila	2.2	3.5	4.4	12.7
Bogota	1.7	2.6	3.4	9.5
Lagos	0.8	1.4	2.1	9.4

Both cities are rapidly expanding, with low-density development at their fringes while their core areas are constant or slightly declining in population. Table 3 summarizes simulation results using a transportation model developed by the author that was very similar in structure in both cases. The transportation systems were simulated from 1970 and 1972 and compared against available data into the late 1970's.[5,6]

Table 3. Comparison of Transportation Projections for Urban Areas of Mexico City and Jakarta

	1970[a]	1980	1990	2000
Jakarta				
population (10^6)	6.2[b]	9.1	14	19
gasoline and diesel use for personal transportation (10^{15} joules)	12	26	51	87
per capita energy use (10^9 joules)	1.9	2.9	3.5	4.6
Mexico City				
population (10^6)	9.1	16	23	28
gasoline and diesel use for personal transportation (10^{15} joules)	106	153	317	665
per capita energy use (10^9 joules)	11.6	9.6	13.8	23.7

[a] Results for Jakarta are for 1972, the initial year of simulation for the study.

[b] Value for 1972 is not comparable with values in Table 2 for 1960 to 1975 due to the inclusion of populations outside of Jakarta proper that become part of the urban agglomeration, Jabotabek.

Key assumptions used in the Jakarta study included a significant slowing of the population growth rate, a per capita economic growth rate of 4.4 percent per year in real Rupiah, and an income elasticity of trip making of +0.7. Fuel efficiencies of motor vehicles are relatively high and are assumed to improve modestly. The increasing proportion of private motorized trips (motorcycle and automobile) observed during the 1970s continues through the study period. This outcome results from relating propensity to use public transportation to population densities. Because population growth primarily occurs in lower density areas surrounding Jakarta proper, public transportation's share of motorized travel declines from 63 percent of trips in 1972 to 35 percent in 2000.

The Mexico City projections also included a significant slowing of the population growth rate. Average income per capita in real pesos was assumed to increase at 3.8 percent per year and an income elasticity of trip making of +.8 was used. Fuel efficiencies of private vehicles improves less than 10 percent in the analysis and there is a significant shift towards private vehicles.

The results of these analyses in Table 3 show a dramatic increase in energy use for passenger travel. The per capita increases in energy use are less dramatic, showing a growth by a factor of 2.4 for Jakarta and a factor of 2.0 for Mexico City for the period from 1970 to 2000. With these increases, per capita personal transportation energy use in Mexico City in the year 2000 (24×10^9 joules) and Jakarta (5×10^9 joules) are comparable with per capita usage rates in the 1970s for France, Germany, Italy, Netherlands, Sweden, and the United Kingdom (averaging approximately 20×10^9 joules per year for passenger and freight uses).[7]

These levels of usage pose a serious dilemma. Although both Mexico and Indonesia are major petroleum exporters, providing gasoline and diesel fuels is an expensive proposition, drawing needed capital away from other investments and forcing it into petroleum production and refining. Indonesia is particularly concerned because its oil production may have peaked in 1977 and domestic consumption is steadily eroding its exportable oil upon which the economy is heavily dependent for export earnings (oil represents well over half). Oil-importing countries face a considerably more difficult situation.

At a global level, a 20×10^9 joules per capita consumption rate (this is approximately 25-30 percent of the United States rate in 1980) appears to be unsupportable. For example, if the 3.2 billion urban residents in the year 2000 were on average to use oil for transportation at this rate, global oil reserves, as of January 1983[8], would be depleted in only 64 years. This assumes that urban populations and per capita usage levels remain constant at their 2000 levels with no additions to reserves. Oil would not be used for purposes other than transportation, and non-urban dwellers are ignored. This extrapolation is intended only as a heuristic device, but it suggests the magnitude of the problem.

The air pollution situation is equally serious. Table 4 summarizes simulation results from the Jakarta and Mexico City studies.

Table 4. Carbon Monoxide Emissions and Concentrations

	1970	1980	1990	2000
Jakarta				
Carbon Monoxide Emissions (10^6 tons)[a]	.25[c]	.59	1.2	2.3
Mean Annual Ground Level Concentration (ppm)[b]	20[c]	.60	1.2	2.3
Mexico City				
Carbon Monoxide Emissions (10^6 tons)[a]	3.9	3.4	4.7	10.5
Mean Annual Ground Level Concentration (ppm)[b]	8	7	10	22

[a] Automobile and motorcycle sources only.
[b] Calculated using reference 9 as an urban area average. Values are very approximate due to data and methodological limitations.
[c] Values are for 1972.

Projections of carbon monoxide emissions, used here as an indicator of overall air pollution trends, increase dramatically, as do the estimates of annual ground level concentration in the urban areas. Mexico City, which has notoriously bad air pollution, is simulated to have an average annual concentration of 7 ppm in 1980. This value compares closely to monitored data for 1978 in the central part of the city.[10] The yearly, 8-hour peak episode will be on the order of three times higher, which also corresponds to monitored data which records a 22.41 ppm 8-hour maximum value. The introduction of automobile emission controls beginning in 1971 temporarily checks the growth of emissions. Even if these controls are maintained, as is assumed in these projections, the growth in emissions resumes in the late 1980s and the mean annual concentration reaches 22 ppm in 2000.

Although these results are very approximate due to data and methodological limitations, the implications are extremely serious. Peak 8-hour episodes would be on the order of 60 ppm, with local areas at far higher values. For perspective, United States National Ambient Air Quality Standards for carbon monoxide are not to exceed 9 ppm for 8 hours, and 35 ppm for one hour, once per year.

Jakarta is in a much better situation in regard to emission rates and air pollution because it is at sea level and not tightly constrained by mountains. The relatively low levels of urban-wide annual concentration are somewhat misleading in that they are calculated as an average over a much larger land area. When concentrations are calculated for Jakarta proper, they are roughly three times larger than shown in Table 4. Within fifteen years, Jakarta will have an air pollution problem approaching the situation in Mexico City in 1970.

Observations on Urban Sustainability

The grim prospects presented here may not come about for the compelling reason that the situation would be so severe as to force action to alter these outcomes. Faltering economies with growth rates below the official projections used here may constrain the ability of many people to purchase motor vehicles. Policy options such as encouraging non-motorized travel, multinucleating cities into self-contained subcenters, limiting urban growth and encouraging growth in smaller cities, discouraging specific types of motorized travel or vehicle ownership, have been and continue to be discussed in various levels of government in Mexico and Indonesia. The adoption of these and other policies to any significant degree has yet to occur in either city. Meanwhile, traffic patterns and roadway provisions make the use of bicycles very dangerous. The areas in Jakarta where becaks may operate are increasingly limited.

At another extreme, there are the examples of Beijing, Shanghai, Ho Chi Minh City, and Pyongyang, which have effectively controlled population and function as major urban areas without significant numbers of automobiles and motorcycles.[11] Ho Chi Minh City (formerly Saigon) has dramatically reduced population and essentially eliminated private motor vehicles.

The examples of Mexico City and Jakarta suggest that large, automobile-or other motor vehicles-dominated cities may not be sustainable. Even if cities can afford the vehicles and related transportation infrastructure, the issues of energy availability, energy cost, and air pollution may challenge their viability. Cities in developing countries that are part of the massive global urbanization envisioned in Table 1 need to recognize these constraints if they are to avoid building and being locked into urban forms[12] that require high levels of private motor vehicle ownership and use.

REFERENCES

[1] The Council on Environmental Quality and the Department of State. The Global 2000 Report, U.S. Government Printing Office, 1982.

[2] Report by the Energy Systems Program Group of the International Institute for Applied Systems Analysis. Energy in a Finite World: A Global System Analysis, Ballinger Publishing Co., 1981.

[3] Holdgate, Martin W., Mohamed Kassas, and Gilbert F. White. World Environmental Trends Between 1972 and 1982. Environmental Conservation, 9(1), Spring 1982.

[4] Hanson, M.E. and W.K. Foell. Transportation Systems Planning and Energy Management: An International Perspective, Proceedings of the Third International Conference on Energy-Use Management, Berlin, FRG, 25-30 October 1981.

[5] Hanson, Mark E. Energy Implications of Urban Transport Systems in Mexico, Proceedings of a Workshop on Planning and Management of Energy/Environment Systems in Mexico, Energy Research Center Report 80-104, University of Wisconsin, 26-27 November 1979.

[6] Hanson, Mark E. A Preliminary Analysis of Personal Transportation Energy Use in Jabotabek, Proceedings of the Intensive Course/Workshop on Energy System Analysis and Planning in Indonesia, Energy Research Center Report, University of Wisconsin, 21 February - 27 March 1983.

[7] Darmstadter, J., J. Dunkerley, and J. Alterman. How Industrial Societies Use Energy: A Comparative Analysis. Resources for the Future, John Hopkins, 1977.

[8] U.S. Department of Energy, Energy Information Administration. 1982 International Energy Annual, DOE/EIA-0219(82), Superintendent of Documents, September 1983.

[9] Dennis, R.L. The Smeared Concentration Approximation Method: A Simplified Air Pollution Dispersion Methodology for Regional Analysis, International Institute for Applied Systems Analysis, RR-78-9, July 1978.

[10] Secretaria de Salubridad y Asistencia, Subsecretaria de Mejoramiento del Ambiente. Situacion Actual de la Contaminacion Atmosferica en el Area Metropolitana de la Ciudad de Mexico, Memorandum Tecnico SMA/DGS At/04-78, 1978.

[11] Vining, Daniel R. Jr. The Growth of Core Regions in the Third World. Scientific American, 252(4), April 1985.

[13] For an overview of the relation of urban form and its relation to the automobile and environmental quality in the U.S. see: Brian J.L. Berry. Do Variations in Urban Form Affect Environmental Quality?, International Institute for Applied Systems Analysis, Research Memorandum RM-74-24, 1974.

V. G. Our Global Connections: the World Conservation Strategy and the Role of International Agencies

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I expect that each and every one of you is motivated to ask three questions. First, what is being done to help resolve global conservation problems? Second, who are the active participants in this important work? Finally, how can I and my organization become involved?

I hope that I am not being presumptuous in expecting you to ask yourself these questions. Addressing these questions is the first step toward taking the actions which are needed to resolve these critical problems, the actions which in turn can change the course of the future by dramatically decreasing the scale of the ecological losses which we are now facing. Today, I would like to discuss briefly some of the answers to these three questions.

First, let us begin by considering some of the actions that are being taken to solve the planet's conservation dilemmas. In 1980, the International Union for the Conservation of Nature and Natural Resources (IUCN), in cooperation with the World Wildlife Fund and United Nations Environment Programme, published the World Conservation Strategy (WCS), a document which is the product of an extensive consultative process which brought together the differing views of environmentalists from around the world to shed a new light on the constantly growing problems that our planet is facing. The Strategy represents a major breakthrough in the thinking of conservationists, as it provides the framework for a new approach to worldwide economic development in a sustainable balance with sound ecological principles. The Strategy explains the importance of conserving our living resources and their importance to human survival, at the same time identifying the world's priority conservation issues and the main approaches to resolving them. It presents the process of ecologically sustainable development in a way which can be easily understood by conservationists, developers, and government officials.

The World Conservation Strategy has three main objectives which can be summarized as follows: maintaining essential ecological processes and life support systems on which human survival and development depend; preserving genetic diversity as the base upon which species and ecological processes depend; and ensuring the sustainable utilization of species and ecosystems. These goals must be achieved with the utmost speed and effectiveness if we are to reverse the current trends which are decreasing the earth's ability to support life in both industrial and developing countries.

I do not intend today to present you with a complete list of the priority actions which are recommended in the Strategy, but rather I would like to give you a sampling of the issues and recommendations.

As you are aware from previous comments, the problems faced in tropical ecosystems are severe. The Strategy recommends, as a priority action, the conservation of these forests in West and East Africa, South and Southeast Asia, Central America, Mexico and South America. In those countries where parks have been established, it is important to develop programs so that local people can benefit from these protected areas and their buffer zones. Unesco's Man and Biosphere Program (MAB) provides an exemplary approach to this type of integrated conservation. The needs and benefits of rural people are actively integrated into the management of each of MAB's Biosphere Reserves.

In other areas, it is becoming ever more critical to design and strategically implement reforestation programs. While these efforts are generally extremely costly, they often represent the only possible resolution of environmental problems caused by years of waste and misuse of fragile tropical forests.

The World Conservation Strategy also focuses attention on the important matter of international conservation laws and the means of implementing them. Intentional conservation conventions provide both important opportunities and difficult challenges. By their very nature, these laws are self-imposed and thus enforcement is based on self-restraint and goodwill. As such, it is often difficult to develop agreements which have substantial strength, and it can be even more difficult to oversee and insure proper local enforcement.

The Convention on International Trade in Endangered Species (CITES), is one such law which is, I am certain, familiar to all of you. Other examples include the World Heritage Convention, which recognizes the need for all nations to set aside and protect areas which represent unique natural and cultural assets for all of mankind. The Migratory Species Convention is perhaps an even more interesting example of the need for international cooperation, because it attempts to resolve concerns which can only be dealt with on a multinational basis.

In yet another section of the Strategy there is a discussion of the importance of gaining local support and participation as a means for building support for conservation. I will refer to this again later, when I begin to speak about "what you can do."

With this brief background on the types of actions that are needed and being taken, I would like to move my discussion on to the matter of the second question, namely, who are the active participants in international conservation work. In the next few minutes I will only be able to mention a few organizations, by no means an exhaustive list.

Let me begin with the IUCN. This organization has some very special characteristics because it is an organization of institutions. The IUCN currently has approximately 525 institutional members, some 60 of which are national governments, 125 government agencies, and roughly 340 non-governmental organizations. These members meet every three years in a general assembly to discuss conservation matters of global concern and to establish policies and action priorities for the Union as a whole. The IUCN's Secretariat is based near Geneva, Switzerland, where it is housed jointly with the World Wildlife Fund in the World Conservation Centre.

The IUCN is much more than an organization of conservation agencies. It also encompasses six technical commissions that contain almost 2000 experts from around the world in the fields of species survival, protected areas management, environmental planning, education, ecology, and environmental policy and law. Through its Secretariat and Commissions, the IUCN conducts a variety of major program activities. For example, the Species Survival Commission and Conservation Monitoring Centre constantly reviews the status of species and ecosystems throughout the world; at the same time, the Conservation for Development Centre has been working with governments in almost 20 countries to develop national conservation strategies.

I would just like to mention a few details about the IUCN's Commission on Education, which I have presided over as chairman since November of last year. The IUCN's Commission on Education (CEduc) was established a year after the founding of the Union, in 1949. It is an international, voluntary group dedicated to enhancing the quality of life through educational programs which promote conservation and sustainable development throughout the world. Its objective is to make the general public aware of the environment, to understand the need to protect it, to use natural resources wisely, and to motivate participation in activities which will attain this objective to the benefit of present and future generations.

CEduc's goal is to stimulate the general public and selected groups through education, to act for environmental improvement by generating an understanding of, and commitment to, environmental ethics. In order to achieve this goal, CEduc aims to:

- emphasize the relevance of conservation to the quality of life;
- assist in developing and implementing activities which would provide educational resources to the priority projects identified by IUCN and the WWF.
- promote educational and training programs which foster environmental competence through greater awareness, understanding, and a system of values consistent with the principles of conservation;
- stimulate and collaborate with national and international bodies, both government and non-governmental, in pursuing such educational programmes; and,
- maintain a worldwide overview of environmental education and training.

The Commission targets its programming toward policy-makers and planners, educators, young people (through formal and non-formal settings), and the public in general. Recognizing the need for differing educational approaches, CEduc supports the appropriate use of a variety of media, including radio, television, films and video. The officers of the Commission are the Chairman, Deputy Chairman and Programme Officer. The Steering Committee, composed of Working Group Chairmen, IUCN Regional Committee Representatives, Cooperating Agency Representatives and Special Task Force Chairmen, meets several times a year to discuss the operations and programming of the Commission. The CEduc Programme Officer is a full-time employee and represents the Commission at the IUCN world headquarters in Gland, Switzerland.

The Commission currently contains representation in the form of working groups, IUCN regional committees, and cooperating agencies. Some examples of the working groups that are now operating are: Decision-Maker Education, Mass Communications, Ethics, and Rural Education. Recent achievements of the Commission include the publication and distribution of Introduction to the World Conservation Strategy and Environmental Education about the Rainforest. In addition, in cooperation with the United Nations Environment Programme, we have recently completed an international workshop for youth leaders in the environmental movement, with representatives from 23 countries. At the present time CEduc is making plans for the development of a worldwide network of educational resource centers which can serve as the focal point for our efforts on each continent. This "dream" will undoubtedly take several years to achieve.

Several other institutions play direct and important roles in international conservation. The World Wildlife Fund (WWF), founded in 1961, has become the world's largest international conservation organization and foremost group committed to the preservation of endangered species and habitats. WWF has its international headquarters in Gland, Switzerland and, with 24 WWF affiliate offices located throughout the world, has accounted for the distribution of over $85 million in support of some 3800 scientific research, education, and wildlife and habitat preservation programs in over 130 countries.

WWF's scope is the conservation of nature and the natural environment in all its forms: fauna, flora, landscapes, soils, water, air, and other natural resources. They aim to create awareness of threats to the environment and to generate and attract on a world-wide basis the strongest possible moral and financial support for safeguarding the living world and to convert that support into action based on scientific priorities. Since its founding, WWF has served as a catalyst for conservation action, brought its influence to bear on critical conservation situations, and provided a link between conservation needs, the scientific resources necessary to meet them, and the governments and other authorities whose action is needed.

The United Nations Environment Programme was established in 1972. Its mandate is to keep the world environmental situation under review, in order to ensure that emerging environmental problems of international significance receive appropriate consideration by governments, and to safeguard the environment for the benefit of present and future generations. UNEP plays a catalytic and coordinating role with the organizations of the United Nations family and administers the "environment fund," which is based on voluntary government contributions. For your information, the U.S. contribution to this fund has remained stable at $10,000,000 annually for the past 13 years, with no adjustment whatsoever for the substantial inflation which has occurred over this period.

UNEP's environment fund assists in promoting activities relating to environmental assessment and management, including priority programs in environmental health, terrestrial ecosystems, environment and development, oceans, energy and natural disasters.

Now, to the final and perhaps most important question, what can you and your organizations do to help resolve the environmental problems which are facing us globally? Although I will not treat this in depth, I would like to give you a few thoughts because the universities and other institutions that you represent offer a special opportunity for one of the most important steps in achieving long term success with our efforts, namely building support for conservation.

Building support for conservation involves creating awareness, educating and motivating people to action, because relatively little can be achieved for conservation without an adequate base of knowledge and understanding. Each new generation must learn for itself the importance of conservation, or risk the health and ecological stability of the planet; while we most certainly can survive without being able to read or write, if we lack environmental literacy we shall not long survive.

The potential role of the NAEE and its members in helping to resolve international conservation problems through environmental education is extremely important. Your institutions represent the opportunity to bring the message of ecologically sustainable development and conservation to millions of people.

At the same time, because the people who participate in most of the programs that you represent are self-selected, you have a unique opportunity actively to focus your efforts on people who are already interested. Thus, it is even more feasible to educate your visiting publics to the problems of conservation at the local, national, and international levels. It is only with the support of such an educated public that the resources will be made available to undertake the measures which are needed to solve the natural resources management issues which confront us today.

I would like to close with a quote from the late Indira Gandhi, not only an important leader of her country but a leading light for conservation in the developing world.

> Fortunately, there is no real conflict between development and conservation. Enduring development requires a more thoughtful and thrifty use of resources, greater care in the planning and siting of industrial and other projects, measures for stopping pollution, and the bettering, rather than replacing, of existing life styles and traditional working methods.
>
> Recent years have seen an increasing awareness of these issues. The various movements for the conservation of nature and the redressing of the balance of nature which

> has been grievously upset are not impractical idealistic. These movements plead for saner, more practical measures to translate oft-repeated statements of goodwill into actions in time to save the earth and our species...
>
> The worldwide movement for conservation is working against great odds, facing criticism and sometimes ridicule. Its influence grows but not sufficiently. ... Remedies for the world's environmental problems are known, but there is an immediate need ... for international cooperation, for a joint effort by many minds and organizations throughout the world to put the remedies to work.

I will leave you with this charge from Prime Minister Gandhi, to join in this most important work.

REFERENCES

International Union for the Conservation of Nature, United Nations Environment Program, World Wildlife Fund. 1980. World Conservation Strategy: living resource conservation for sustainable development. Prepared by IUCN with UNEP and WWF in collaboration with FAO and Unesco. IUCN, Gland, Switzerland. 72 p.

International Union for the Conservation of Nature, United Nations Environment Programme. 1984. An Introduction to the World Conservation Strategy. Prepared for IUCN by its Commission on Education. IUCN, Gland, Switzerland. 28 p.

V. H. Environmental Limitations on the Development of Easter Island Culture

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Easter Island is the most isolated inhabited piece of real estate on earth. Surrounded by 150,000 km^2 of ocean, Easter Island is 3200 km from the South American continent and 2000 km from the nearest inhabited island (Pitcairn). Easter Island is rather small, having a total area of only 160 km^2 (Bellwood, 1978).

Geology, Climate, Fauna and Flora

Easter Island is volcanic in origin with a number of extinct craters, three of which have fresh-water lakes. The landscape is rolling and hilly with loose lava rocks covering up to 80 percent of the surface in places. The soils are composed of loams and clays developed from parent materials (basalt and andesitic rocks). There are no flowing surface waters due to rapid evaporation and porous soils (Wright and Diaz, 1962). The climate of Easter Island is subtropic to temperate. The average temperature is about 22 degrees Celsius. Rainfall is moderate--125 to 150 cm. per year. The extreme geographic isolation of Easter Island is reflected in its poor biology. Although Easter Island has an ideal climate, the present vegetation consists mostly of grassland. The known native flora consists of only 46 vascular species (Flenley and King, 1984). Pollen analysis, however, confirms the existence of a former forest (Selling, 1946; Heyerdahl and Ferdon, 1961). The presence of charcoal and introduced plant pollens suggests the clearance of the land for agriculture in the past.

There are no indigenous land mammals on Easter Island, only two reptiles (land lizards) and only a few insects. Life in the sea around the island is also sparse. The fish, marine mammal, and turtle population is poor by oceanic standards, with only 109 species identified. The narrow offshore shelf and absence of a coral reef also restrict the density and diversity of invertebrate populations (Randall, 1970).

European Contact

The first European to discover the island was the Dutch Admiral Mjnheer F. Roggeveen, on board the "Arena," Easter Sunday 1722. Roggeveen's visit lasted only one day. However, they observed giant statues standing erect. Wondering how the "naked tattooed savages" could have raised these colossi with no tools, they decided that they must have been molded of clay in place.

In 1770, Easter Island was rediscovered by the Spaniard Don Felipe Gonzalez de Haedo. Gonzalez and his crew remained for six days and completed a survey of the island. They recorded the natives living in caves, stone houses and boat-shaped reed houses; they reported the exceedingly poor fauna and flora of the island, the absence of women and children, and the high incidence of pilfering. The Spaniards indicated that the men were large in stature and measured two, who stood 6 ft. 5 in. and 6 ft. 6 1/2 in. in height. Gonzalez also noted the giant statues, the use of small canoes and stressed the use of sharp edged stones, which could leave wounds as if cut by implements of steel. Gonzalez estimated the island population to be about 3000 persons.

In 1774 Easter Island was visited by Captain James Cook, with the artist William Hodges and naturalist Foster. Hodges drew portraits of the natives and the landscape, which Cook reported as barren and devoid of life. As did the Spaniards, Cook and his men also noticed the absence of women and children and suspected they were hidden in underground caves to which they were refused admittance. Cook and his companions were astute observers and indicated that the stone monuments (moai) and platforms (ahus) were remnants of a past culture. They also noticed that many of the statues had fallen and some of the platforms were vandalized. Cook reported the island resources so scarce that they could not satisfy the demands of the population. In fact, the desperate need urged the natives to trade personal possessions that before this time were considered too sacred for trade.

Two French frigates commanded by J.F.G. de La Perouse came to Easter Island in 1786. Some of the statues were still standing on their ahu with topknots on their heads, although the Frenchmen did report many lying face down. La Perouse also believed the stone statues and ahus to be ancient artifacts. The French took ashore pigs, goats, and sheep. However, the natives killed and ate them before they had a chance to multiply.

In the early nineteenth century, several visits to Easter Island were made by Russian, American, and English vessels to secure slaves. As a result, the Easter Islanders became violently hostile to foreigners.

On Christmas eve 1862 a flotilla of seventeen Peruvian vessels arrived in Hangaroa Bay in search of slaves for the guano mines on the Chilean coast. The Peruvian slavers went ashore and drove all the natives they could find to the beach. The islanders were too terrified to resist. One thousand natives were taken and sold to the guano companies in Chile.

Bishop Jaussen of Tahiti protested the crime and succeeded in having the Peruvian authorities order the return of the Easter Island slaves. However, this assistance came too late. Nine hundred of the Easter Islanders died of diseases which they could not resist and a smallpox epidemic killed 85 of the natives who were returned. The fifteen survivors spread the disease to the remaining Easter Island population. The entire Easter Island population was reduced to one hundred and ten individuals, according to the census of 1877 (Heyerdahl, 1976).

Modern Easter Island Archaeology

Early records of Easter Island were dependent on the accounts of early explorers. As a result, the past of Easter Island has led to mystery and ridiculous theories. However, the Norwegian Expedition to Easter Island led by Thor Heyerdahl in 1955-56 opened the beginning of modern archaeology which has continued with the work of William Mulloy and others. An analysis of the research conducted by members of Heyerdahl's expedition concluded that there were three distinct divisions in the chronology of Easter Island: early period (A.D. 400 to

1100), middle period (A.D. 1100 to 1680), and late period (A.D. 1680 to 1868). The early and middle periods were defined on the basis of architectural changes in the ahu wall construction. Walls of the early period were identified as those with finely cut large stone slabs precisely fit into place. The middle architectural period is distinguished by walls built of stones fitted primarily by selection with a minor amount of working and fitting with little or no dressing on the outer surfaces (Smith, 1961).

During the middle period, the platforms were embellished with the massive standardized stone statues for which the island is famous. Finally, the late period is characterized by the dramatic decline and ended with the arrival of Christian missionaries.

Cultural Degradation

In contrast to the progressive development that produced a culture of world-renowned statuary and megalithic architecture, the final 200 years of pre-history were a period of rapid decadence. Ecological and archaeological evidence suggests man-induced environmental change as an alternative explanation for cultural decline. The long-term cumulative effects of population growth on a land with limited fauna and flora resulted in an irreversible process of environmental degradation. It is easy to envision the eventuality of near total deforestation in a relatively short time. It is certain that only a small remnant of a forest remained at the beginning of the eighteenth century. There are repeated references to early ethno-historic accounts of a barren landscape and the small number of canoes (Roggeveen, 1908).

Forest clearance and use of shrubbery, vegetation and grasses were essential to meet cultural needs. This is demonstrated in the dependence on wood and plants for the construction of pole and thatch house building, fuel for heat and cooking, canoe making, the manufacture of utilitarian and ritual objects, and finally the necessity for large timbers or logs to be used in the transport and placement of statues on ahu (Mulloy, 1970). The magnitude of this specialized use pattern undoubtedly hastened the process of forest decline. Thus the abrupt abandonment of statue building in the sixteenth to seventeenth centuries could be linked to the unavailability of large trees, which were a prerequisite for the production and transport of these images to the ahu. The techniques which could have been used to transport and place the giant statues on ahu were demonstrated by Mulloy in the reconstruction of ahus Ko te Riku, Tahai, and Kivi.

The increasingly barren landscape had a profound effect on the economy, resulting in a decrease in crop yields. Lack of wood for the construction of canoes suggests reduced catches of deep-sea fish, which could place a greater importance on domestic fowl as a source of protein, since there were no dogs or pigs on the island. In such an isolated environment, any acquisition of new resources through trade or the borrowing of technological innovations was impossible. Thus, the islands' resources and its population declined hand in hand. The population spent much of its time fighting over the scarce resources and temporary escape was only possible by hiding in refuge caves or fleeing to nearshore inlets; but neither ensured a good chance of survival or freedom from eventual captivity to become slaves or to be used as food (McCoy, 1978b).

REFERENCES

Bellwood, Peter S. 1979. The Polynesians. Thames and Hudson.

Flenley, J.R. & M. King, Sarah. Late Quartermary Pollen Records from Easter Island. 1984 Macmillan Journals Ltd.

Heyerdahl, Thor. The Art of Easter Island. London. George Allen & Unwin Ltd. 1976.

Heyerdahl, T. & E.N. Ferdon Jr. (eds.). Reports of the Norwegian Archaeological Expedition to Easter Island and the East Pacific. Vol. 1. Forum, Stockholm, 1961.

McCoy, P.C. Easter Island. Chap. 6. The Pre-History of Polynesia, J.D. Jennings, (ed.) 1979. Harvard University Press.

McCoy, P.C. 1978. Easter Island Settlement Patterns in the Late Pre-historic and Proto-historic Periods, Bull. 5 Easter Island Committee, New York: International Fund for Monuments.

Mulloy, William. 1970. Preliminary Report on the Restoration of Ahu Huri a Urenga and Two Unnamed Ahu of Hanga Hio'e, Easter Island. Bull. 3, Easter Island Committee, New York: International Fund for Monuments.

Randall, J.E. 1970. Easter Island: An Ichthyological Expedition. Oceans 3:48-59.

Roggeveeen, Jacob. 1908. Extracts from the Official Log of Mjnheer J. Roggeveen (1721-22) Hakluyt Society, Vol 13. Cambridge.

Selling, O.H. Bernice P. Bishop Museum. Spec. Publ. 37-39. Honolulu (1946-48).

Smith, Cp. S. 1961. A Temporal Sequence Derived from Certain Ahu. In Reports of the Norwegian Archaeological Expedition to Easter Island and the East Pacific, ed. Thor Heyerdahl and E.N. Ferdon, Jr. Vol. 1, pp 181-219.

Wright, C.S. and V. Carlos Diaz. 1962. Soils and Agricultural Development of Easter Island. Unesco Quarterly Report, suppl. 1.

V. I. The Development of an Environmental Education Framework for Kenya

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Introduction

Concern for the environment and the desire for improved well-being are the major struggles for developing countries. Yet, in these newly independent countries, economic development and environmental protection are often considered as adversaries. Kenya has only been a free republic for the past twenty-two years, but unlike most of its neighbors, it is by far the most agriculturally and industrially developed country in East Africa (Ogendo, 1970; Olembo, 1983). Kenya shares its borders with Ethiopia, Sudan, Tanzania, Uganda, and Somalia. Straddling the equator, the breath-taking topography of the land is graced by varied climates, from the sub-tropical coastal plains to the temperate regimes in the highland region and to the semi-arid savannahs of the interior (Ojany, et al., 1973; Ominde, 1971). The great Rift Valley, a 50 to 70-km-wide chasm extending south from Lake Turkana, deepens to 600-900 meters below the surrounding land, forming a spectacular geological phenomenon. It is in this region that the earliest records of human habitations are linked (Leakey, 1962).

The rich fertile volcanic soils of the great volcanic heights, such as Mount Kenya (5194 meters) and Mount Elgon (4267 meters) have led the highland region to be known as the granary of Kenya. It is in this region where most of the country's population live; agricultural cash crops for export such as coffee, tea, pyrethrum, and the bulk of the food crops are grown (Ojany, et al., 1973). In addition, the grassy savannah plains are a home of countless species of flora and fauna. The infamous Kenyan national parks and game reserves are found in these areas; Kenya's white sandy beaches along the Indian Ocean attract tourists from all over the world, thus making tourism the second largest source of foreign exchange (Kenya, 1985).

However, Kenya is being rapidly raped of its beauty because of human greed to conquer and exploit the limited natural resources for the needs of the economy and achievement of freedom. The major forerunners of environmental destruction include unchecked population growth, unabated deforestation and soil erosion, pollution of lakes and rivers, destruction of marine and wildlife, and increased pressure on marginal arid lands (Campbell, 1981).

Environmental management and conservation has been found to pay handsomely. In industrialized countries, apart from the practical advantages of conservation and protection, there is added bonus of creating new jobs, observed Dr. Mostafa Tolba, Executive Director of the United Nations Environmental Program (UNEP) (Tolba, 1984). Recognizing the importance and potential benefits for humankind, the United Nations Conference on the Human Environment urged the world countries to initiate Environmental Education in 1972. Yet, today when we survey the task at hand and take inventory, only the developed countries seem to have taken these issues seriously. In the developing countries, the concept of environmental education itself rests on a vague and uncertain conceptual foundation.

Need for the Study

In Kenya, the need for environmental education was first expressed nine years ago when the permanent secretary in the Ministry of Education made the first move to bring environmental education into the classroom. A circular letter was directed particularly to biology, chemistry, and physics teachers in the primary and secondary schools, teacher training colleges, and Kenyatta University College. These teachers were asked to include specific environmental topics in their teaching in order to help students develop a "keen environmental awareness."

Despite the intentions of the Ministry of Education, no environmental education programs have proliferated in the Kenyan school system to date. Exceptions consists of a few courses on the environment offered at Kenyatta University College.

In examining some of the environmental constraints that face Kenya, one begins to acknowledge the importance of environmental education. The most urgent environmental issues to be addressed are those related to population growth, housing and poverty, forest depletion and soil erosion, careless land use practices, energy and socioeconomic factors, and economic development prospects.

Kenya's population currently stands at about 18 million and is growing at four percent annually (the highest growth rate in the world); its population is expected to double by the year 2020 (New York Times, 1984). Recent studies have shown that the population has exceeded, in some areas, the land carrying capacity (Bernard, 1977). Population pressure has forced people onto marginal lands with low potential for agriculture. The hilly areas and forest reserves which normally would be off limits are now penetrated by settlements and illegal squatters (Maghenda, 1982). In addition, there is an acute land shortage; demand for conventional housing is high; low income groups and unemployed migrants are forced into the cities and must live in substandard housing such as the infamous Mathare Valley in Nairobi. Poverty, on the other hand, reinforces the detrimental impacts of a strained population and the land, causing health stresses, unsanitary conditions, and impoverished living (Kenya Report, 1972).

Careless land use practices such as deforestation have enormous impact on the environment. Once forest are cleared, soil erosion sets in and the energy needs of the majority are undermined. As an example, 80 percent of Kenya´s population live in the rural areas; their energy comes from forests (in way of fuelwood), food from the soil, and water is obtained directly from rivers (Kenya Report, 1972). Yet, as important as the land is to their sustenance, deforestation and soil erosion continue unabated; population growth is unchecked and pollution of rivers and lakes is becoming rampant. Certainly an awareness of the link between population, resources and the environment needs to be established. Developing an environmentally aware citizenry who are knowledgeable about environmental issues, consequences, and who are willing to take action in resolving and preventing problems is important if each Kenyan´s future is to be preserved.

The Problem

The overall purpose of this research was to: (1) gather empirical evidence of Kenyan environmental awareness, concerns and attitudes; and (2) to use the evidence to develop an environmental education framework relevant to all learners.

Given the ambition and breadth of this study, the following questions were used to guide and analyses of the empirical data:

1. Do significant differences in concerns and attitudes exist between students from highland and coastal/lowland regions in Kenya?

2. Are there any differences in students´ concerns and attitudes about environmental issues with regard to gender?

3. Are there any differences in concerns and attitudes about environmental issues among students from different geographical regions and places of residence (i.e. rural, urban)?

4. Are there any significant differences in students' concerns and attitudes about environmental issues with regard to their socioeconomic status (as determined by the parents' or guardians' occupation)?

Procedures

Sample. To obtain a representative sample of students from across the country, twelve national government schools were randomly selected. These schools have an open admission system, and students from any part of the nation can apply, as opposed to unaided schools which tend to be more regional or localized. A sample of 1060 Form IV secondary school pupils was obtained. Fifty of the survey responses obtained were discarded for missing values. The sample consisted of 412 rural males, 285 rural females, 149 urban males, and 164 urban female students from two divergent geographical regions (i.e. the highland and coastal/lowland).

Instrumentation. The instrument surveyed students' concerns and attitudes about community and national level environmental issues. The first part of the instrument was aimed at obtaining pertinent demographic data. These data included geographical region of the home, residence, either rural or urban, gender, age and socioeconomic status. The second part was composed of six sections each containing issues relevant to the Kenyan environment. The items were developed through an extensive national and international literature review.

Eight broad categories of environmental concerns were discerned from the literature. In order to determine content validity, the survey instrument was examined by environmental experts in the USA, and then validated by a panel of Kenyatta University lecturers in Kenya. The survey instrument consists of Likert-type scales. Reliability was obtained using split half techniques, which resulted in a Cronbach's coefficient of 0.89. The sections were individually tested for reliability as well.

Data Collection. The administration and data collection were done by joint effort of headmasters and headmistresses of the schools included in the sample and the researcher in the winter of 1984. Upon completion of the surveys, the student responses were individually coded with identification numbers and scored for analysis.

Data Analysis Techniques. Data from the survey were analyzed by SPSSX computer subprograms. Subprogram FREQUENCIES provided distributions for student responses. RELIABILITY permitted the evaluation of the multiple-item attitude tests through the computation of a widely recognized Cronbach's coefficient of reliability. CROSSTABS cross tabulated contingency tables for discrete variables in the study. The means for each subclass used in the analyses of variance were generated using the subprogram MEANS. FACTOR was used to reduce the data, explore the clustering of items, confirm and identify environmental issues in factorial form, and provide evidence for testing students' concerns and inferring attitudes about those specified issues. Eight factors were identified and named:

F1 Land use and health stresses;
F2 Community environmental risks;
F3 National environmental problems;
F4 Careless land use (community level);
F5 Socioeconomic elements;
F6 Sources of environmental information;
F7 Careless land use (national level);
F8 Primary population pressures.

MANOVA provided generalized multivariate analyses of variance permitted univariate comparisons useful for testing the sources of variation with the eight factors. The significant tests were followed by Tukey's Honestly Significant Difference (HSD) tests.

Results. The significant multivariate and univariate tests were used to answer the research question stated in the problem section of this paper. The results obtained suggests that there are significant differences in concerns and attitudes about environmental issues by Form IV students in Kenya. Tukey's HSD tests revealed the following results on the research questions stated under the problem section of this study.

Question 1

A. Students from the highland region showed no significant concerns about environmental issues as expressed in factors 2, 3, 4, and 5 when considered together.

B. Coastal/lowlands region students showed no significant differences on factors 2, 3, 4, and 5 when considered together.

Question 2

A. Males showed no significant concerns about issues contained in factors 1, 3, 6, and 7.

B. Females showed significant concerns on factors 1 and 3 and were less concerned than males about factors 6 and 7.

Question 3

A. Coastal rural students were less concerned about environmental issues contained in factors 2, 5, and 8.

B. Coastal urban students were significantly more concerned about the environmental issues expressed in factors 2 and 5.

C. Highland urban and rural students were significantly concerned about environmental issues expressed in factors 2 and 5.

D. All the rural and urban students from both regions were not concerned about the most critical issues facing Kenya i.e. population pressures contained in Factor 8.

Question 4

The results on this question tended to suggest that students differ in their concerns and attitudes about environmental issues because of their socioeconomic backgrounds. Tukey´s HSD post hoc tests revealed the following results:

A. Students whose parents are farmers were significantly less concerned about issues in factors 1, 2, and 3.

B. Students whose parents are civil servants were significantly concerned about issues in factors 1, 2, and 4.

C. Students whose parents are business people were significantly concerned about issues in factors 1, 2, 3, and 4.

D. Students whose parents are teachers showed less concern about issues in factors 1 and 4, but were significantly concerned about issues in factors 2 and 3.

E. Students from all the socioeconomic backgrounds mentioned were not concerned about national environmental issues contained in Factor 7.

Implications. The establishment of differences and diversity in concerns and attitudes of students about environmental issues are important in the development of an environmental education program. The significant differences evident among student concerns and attitudes indicate that these variations and exceptional views must be considered when standardized curriculum framework is proposed.

Lack of concern particularly for population problems (Factor 8) by all students indicates that Kenya's population problems which already have gone unchecked requires special treatment in the educational system. The lack of concerns about environmental issues at national level (Factor 7) as well as differences in levels of concern by various student subclasses, and their socioeconomic background influences can be directly attributed to either a lack of knowledge, and awareness, negligence or negative predispositions (e. g. don't care attitudes) toward the environment.

The goal of this study was to establish concerns and attitudes about environmental issues and use the results to suggest an environmental education framework aimed at: (1) enhancing students' awareness of their environment; (2) developing positive attitudes toward their environment; (3) encouraging public support for national environmental policy-making; and (4) stimulating responsible public actions toward local and national environmental problem-solving.

Conceptual Framework for Environmental Education. The principal aim of Environmental Education is that of providing teaching and education at different levels to improve people's knowledge and attitudes--hence also, their readiness to take individual and collective action to alleviate environmental problems and promote environmental conservation awareness (UNESCO, 1980). Emphasis can be placed on different approaches to achieve this aim, and ensure environmental awareness, and management.

It is therefore imperative that environmental education focus on the interrelationships of man and all the physical and biological elements of the environment; and deal with the harmonious linkages between them. Human populations, cultural, political and economic factors have a direct impact on the environment and must be clearly articulated by the educational framework.

Conclusion

Given the diversity in student concerns and attitudes discussed in this paper, a standardized national curriculum framework is doomed to failure. The nature of the programs needs to be addressed within local, regional, and global perspectives. The local needs should dictate specific learning activities and materials. Environmental education materials need to be developed by teams of experts in conjunction with educators and the leaders in the country. The importance of environmental education must be viewed in terms of the country's desire to sustain itself now and for the future.

REFERENCES

Bernard, F.E. June 1977. Population Pressure: A Preliminary Assessment with Special Reference to Kenya. East African Geographical Review, No. 15, pp. 43-68.

Campbell, D.J. 1981. Land Use Competition at the Margins of the Rangelands: An Issue in Development Strategies for Semi-arid Areas. In G. Norcliffe and T. Pinfold (eds.), Planning African Development. London: Croom Helm.

Kenya's National Report to the United Nations on the Human Environment. 1972. Nairobi: Professional Printers and Stationers.

Kenya Economic Quarterly. 1985. The Economist.

Leakey, L.S.E. 1972. Earlier Prehistory, in W.T. Morgan (ed.), East Africa: Its peoples and resources. 2nd ed. Nairobi: Oxford University Press, pp. 9-14.

New York Times. 1984. Sunday, July 22.

Olembo, R. The East African Region: A Collection of Diversity. Ambio, Vol. 12:6, pp. 284-287.

Ogendo, R.g. 1970. Industrial Geography of Kenya. Nairobi: East African Publishing House.

Ojany, Francis F., and B. Ogendo Reuben. 1973. Kenya: A Study in Physical and Human Geography.

Ominde, Simeon H. 1971. Studies in East African Geography and Development. Berkeley: University of California Press.

Tolba, M. 1984. Excessive Demands on Our Environment Cannot be Sustained for Every Land. The Courier, No. 87, September-October, pp. 60-62.

Unesco. 1980. Environmental Education in the Light of the Tbilisi Conference. United Nations, Paris.

V. J. Peru's Environmental Dilemma

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Perhaps in the 1990s the tropical rain forests of Peru will be almost gone. At the present time much of Peru's Amazon region, back from the rivers, is relatively untouched. Those who are concerned about the destruction of species-rich tropical habitat expect that not more than 5 percent will survive the development efforts of both the government itself and foreign entrepreneurs from multi-national corporations. Both seek to exploit Peru's natural resources. On the other hand, Peru has committed very large areas of critical habitat to National Parks and Preserves. The dilemma the country faces is the need for development now to improve the nation's economy and the standard of living while preserving the fragile tropical forest ecosystems with unknown and unstudied values to provide a sustainable future. Many pressures, economic, social and political, place Peru's resources at considerable risk. This paper discusses some of these pressures and their effects on the environment.

Although Peru's population in relation to its land area is not great when compared to developed areas, many of the peasant peoples are desperately poor and the nation is sometimes unable to supply basic services.

These problems are likely to become even more acute in the future. A continuation of the population growth rate of 2.6 percent will cause the population to double in 27 years. The poor and jobless have flooded into Lima from the countryside, raising the city's population from 2 million in 1960 to 5.5 million today. Many of these people live in shacks without sanitation, water, electricity and also without hope of a better life. Peru's debt to western nations, including the U.S., is high (Couture, 1985). This and the rate of inflation, which has been over 200 percent, have sharply decreased the value of the sol. Wages purchase fewer goods and services and funds designated by government for public works fall short of needs.

The Sierra

The large farming population of Quechua and Aymara Indians in the Andes are also affected. Sale of farm products does not cover living expenses and the cost of agricultural production. To increase production and income, the smallholders work marginal land on steep, erodible slopes. For the most part, this sierra land is not fertile. The farming community is dependent on petroleum-based chemical fertilizers which are imported from the U.S. at prices tied to the high dollar and the high cost of petroleum. It is ironic that this dependence has occurred, since, only decades ago, Peru produced high quality organic fertilizer from the guano or wastes of enormous colonies of nesting shore birds.

Plans were initiated for agrarian reform during the military regime of 1968-1980, to break up large land holdings and redistribute land into collective farms. Little of the land was given to individuals and many peasant families are still landless. Many of these landless leave their traditional area and drift into the edges of the selva or to the cities. Actually, many of the large selva farms owned by politically prominent families were not affected by the reforms. Myers states that inefficient farm management on 4/5ths of Peru's arable land is the result of absentee owners of large farms (Myers, 1984). Sierra cropland exhibits many of the characteristics of degraded soil (UNEP and FAO, 1983). Farming practices in this region are destroying the soil on which the farmers depend. Fields are often planted with crops vertical to the slope. The runoff from these fields has resulted in severe hill and gully erosion. Grass filter strips or other vegetative cover that could hold the soil are not used. An attempt was made to halt excessive erosion on slopes by planting great numbers of the fast growing tree, Eucalyptus deglupta, an import from Australia. Native species were removed for firewood many years ago.

Before the Spanish conquest, Indian slaves built the farming terraces for which Peru is so well-known and also the ingenious and intricate irrigation systems that watered their grain. This ancient farming system held the soil and used scarce irrigation water efficiently. Very few of these terraces are used for farming today.

The Selva

In the large tropical forest region of Peru, population has increased three-fold in the past 20 years from immigration and also high birth rate--many families have 10 to 12 children (Myers, 1984). The previous (Belaunde) government's policies favored stepped-up development of the area. Road construction, timber cutting, and oil exploration were all initiated without concern for resulting environmental destruction. As a consequence, large forest areas have been stripped in both Peru and in Ecuador. This has caused massive downstream erosion along Peru's river system flood plains (Cunningham, 1963). In some areas because of accelerated run-off, rivers in flood are 20 feet higher than before upstream development. Many of the large rain forest trees have been cut both legally and by poachers. Landowners are advised to brand their remaining valuable trees to preserve them.

Rice is the major crop along the rivers. Slash-and-burn farming techniques are practiced in the selva. Carl Jordan of the University of Georgia, at the Second Conference on Conservation Biology at Ann Arbor in 1985, presented documentation from his studies of ecosystem disruption showing that these small plots do recover when they are abandoned after their fertility is exhausted. The land is wonderfully resilient, but complete recovery takes 80 to 120 years. Up to the present time Peru has not experienced the conversion of unproductive, abandoned smallholdings into cattle ranching--not yet.

Taking of wild creatures for research, pets, and pelts has substantially thinned both the primates and the large cats from the forest. Karr reports that 235,514 animals were taken from the Peruvian selva in one year (Watson [reported in Karr], 1978). Thousands of moths and butterflies are taken daily and sold for home decor both in the tourist centers of Peru and in the U.S.

However, Peru ratified the Washington Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and also has prohibited hunting in Amazona. (The ban excepts subsistence hunting by indigenous rain forest tribes, who are permitted to take abundant and non-endangered species.) This ban has halted trade in live animals and shut off legal channels for export of skins. Poaching remains a problem, as enforcement in this vast area with limitless river transportation is difficult (Barber, 1980).

Population

In both the sierra and the selva, tradition favors large families. The native peoples are intensely religious. Population control has not been a priority of the government. The problem of runaway population growth in Latin America was addressed at the United Nations Second International Population Conference in 1984. Attending nations agreed that population stabilization "should be achieved in the shortest period possible," instability, a population reduction program, even with external funding, would be difficult to prioritize. It is too early to tell if the goal of decreasing population growth can be turned into action.

Development

Several development projects were proposed for Peru's Amazon area by the previous (Belaunde) government. These projects, with a 1981 price tag of $8 billion, were planned mainly for road construction, colonization, and rural development, including forestry. Foreign financing from such sources as USAID, the Inter-American Development Bank, and several western nations has been sought. However, no firm strategy or concrete plan has been devised to implement the projects, other than for the construction of the Villa Rica-San Alejandro highway in the Pichis-Palcazo project area (Smith, 1982). Plans have also been drawn for a major highway through Manu, Peru's largest and least accessible National Park (Moore and Moore, 1983).

Environmental Protection

Who wants to preserve the environment in Peru? The country of Peru itself. Since 1961 Peru has made an impressive commitment to the protection of natural areas in all biomes by creating an extensive National Park system. Both Manu Park in the south and Simiria-Pacaya Reserve in the north are vastly larger than, for instance, Yellowstone Park in the U.S. Not only is Manu large and biologically rich, the Park and 865,000 acres of adjacent national forests and private lands are so unique that they have been declared a Biosphere Reserve by Unesco (Moore and Moore, 1983).

Peru has also established a program and reserve for the preservation of the vicuna. Populations of this ruminant, which is Peru's national symbol, had diminished from two million at the time of the Spanish conquest to possibly 10,000 in the late 1960s. Pampas Galeras Reserve was established in central Peru, where a herd of 600 congregated and very large zones of protection were set up. The ambitious program was originally intended to increase vicuna numbers to 1.5 million by the year 2000. The program was also planned to bolster the economy of the reserve region by using the animals to attract tourists and sport hunters, to produce meat, hides and wool, as well as to provide peasants and communities with experience in wildlife management of a unique resource (Barber, 1980). The vicuna program received wide support from Peru's Public Treasury and many western nations and organizations.

In addition to the Parks and Reserves already within the system, plans were being drawn in 1980 to include five more areas and a further fifteen units have been proposed. Some of these are in the amazon basin and contain unique Pleistocene refuges (Barber, 1980).

However, the National Parks and Reserves in Peru are not as strongly protected as possible. Many were created by presidential decree, not through a broad-based national parks act. Most were established because of the interest and commitment of individuals. Some of the set-aside areas have been preserved as timber reservations and are to be used in the future (Barber, 1980). Many of Peru's unique natural, as well as historical, features have been preserved to increase tourism, so that economic gain will accrue to nearby communities.

In addition to the commitment made by the Peruvian government, many scientists have used their influence to hold back development in the rain forest. These dedicated investigators are racing against time to learn all they possibly can about the millions of species that could be lost as the tropical forest is settled and exploited. Their publications and testimony influence, to some extent, development agencies such as the Inter-American Development Bank and the International Monetary Fund that often in part finance development projects in developing countries.

Such organizations as the International Union for Conservation of Nature and Natural Resources, The World Wildlife Fund, Friends of the Earth, and Sierra Club have given training for professionals, equipment and publicity. They have also raised money to support scientific investigations in Peru. In addition, Peruvian organizations and individuals are concerned and seek ways to preserve the biological diversity of their country.

Scientists in the field, however, paint a gloomy future for the selva. Steven Hubbell of the University of Iowa, who researches diversity of tropical trees, at the Second Conference on Conservation Biology held in Ann Arbor, May 5-8, 1985, predicted mass extinctions within the next 20 years. He said, "We are the last generation to experience a natural world." At the same conference Norman Myers, Consultant in Environment and Development, forecast 90 percent disruption in tropical forests. John Terborgh of Princeton University, who works with students and other scientists at Cocha Cashu Research Station in Manu Park, at the same conference claimed that we can expect that no more than 5 percent of the vast Amazon area will be set aside. There is a compelling need in Peru for the people and the government to understand the environmental limits of both the sierra and selva regions and to face up to the now and future pressures of increasing population and development in these areas.

John Cole, in his review of Roger D. Stone's recent book, Dreams of Amazonia, points to the destruction that was inflicted on U.S. ecosystems as the frontier moved west. He mentions the virgin forests, the grass seas of the prairies and the wild rivers, all fragile ecosystems that were often obliterated and are still being transformed because, he says, it is human nature to develop and expand (Cole, 1985). Looking back on our history of environmental destruction would we, from our present enlightened post-industrial point of view, have done things differently? Would Peru? More to the point, considering our past history, do we have the right to tell another nation with problems as desperate as those now facing Peru, that it is better to sustain environmental integrity than reap the profits from rich national resources by damming, mining, paving and plowing? Myers reminds us that the poor of developing countries are understandably more concerned with keeping themselves alive than with preserving wildlife (Myers, 1979) and Barber finds that Peru, as a whole, does not have a tradition of preservation of nature to build on (Barber, 1980). The most dedicated do-gooder needs to approach this arena with caution and humility.

In a lecture delivered at BGSU as part of the 1983 NAEE speakers tour, John Opie of Duquesne University called attention to the fact that in the U.S. an appreciation of, and desire to preserve, natural areas is a very recent attitude. During the winning of the west, Americans feared the wilderness and believed it should be civilized. At that time, they felt that roads should be built to bring viewers from the cities and towns to a scenic lookout so that they could admire a dramatic "vista." Fear of the unknown--of the tangled darkness of virgin forests and the violence of raging rivers--may be instinctive for humans who have not had personal contact with nature. To value nature, perhaps it is important to experience nature.

This was the theory behind the curriculum that the Rare Animal Relief Effort, Inc. (RARE) developed for teachers in Costa Rica. At the Elementary and Secondary Education Section workshop, a part of the 1982 NAEE Conference at Silver Bay, NY, Grace Lieberman discussed the RARE program which provided wilderness awareness experiences for practicing teachers and involved them in activities that made them feel comfortable in the out-of-doors. Through increased familiarity, they learned to appreciate the interrelationships they discovered in rain forest ecosystems. Teaching teachers can translate into valuable field experiences for their students and an attitude of respect for the natural world. A successful program of this nature could have a positive influence on the next generation of decision makers in Peru.

If the biological diversity of the Amazon and the remaining fertility of the high river valleys of the Andes are not to be irretrievably lost, environmentally sound management practices should be followed. In Karr's discussion of the future relationship of man and wildlife in the tropics he says, "Public education remains an essential component of a sound management system," (Karr, 1978). RARE is now working to help Peru find the ways and means to provide meaningful environmental education. If successful, the development of an environmentally literate, grass-roots constituency would be one step toward resolving Peru's environmental dilemma.

REFERENCES

Barber, Mary L., 1980. National Parks, Conservation, and Agrarian Reform in Peru. The Geographical Review. 70(1):1-18.

Cole, John N., 1985. (Review of J. Roger D. Stone, Dream of Amazonia.) Amicus Journal, 7(1):32-33.

Couture, Gilles, 1985. Banking on Poverty. IDRC Reports. 14(2):7-8.

Cunningham, R.K., 1963. The Effect of Clearing a Tropical Forest Soil. Journal of Soil Science, 14(2):335-345.

Karr, James R., 1978. Man and Wildlife in the Tropics: Past Present and Future. Charles M. Kirkpatrick, ed., Proceedings Wildlife and People, the 1978 John S. Wright Forestry Conference. Purdue Research Foundation, West Lafayette, 120-137.

Moore, Tui DeRoy and Alan Moore, 1983. Peru's Largest Park Safeguards Biological Treasures of the Tropics. Smithsonian. 13:100, 35-43.

Myers, Norman, 1984. The Primary Source: Tropical Forests and Our Future. Norton, New York and London, 367 pp.

Myers, Norman, 1979. The Sinking Ark. Pergamon, Oxford. 254 pp.

Population UNFPA Newsletter, August 1984, 10(8):1.

Smith, Richard Chase, 1982. Peru, Background Documents. Pages 30-31 in Native Resource Control and the Multinational Corporate Challenge: Aboriginal Rights in International Perspective.

United Nations FAO, 1983. Guidelines for the Control of Soil Degradation. UNEP/FAO; Rome. 38 pp.

V. K. Integrated Regional Resources Management-An International Training Package

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The Integrated Regional Resources Management international training package addresses the need, as well as the incentive, for resource managers to work together in order to achieve maximum long-term benefits from all resources within a region. The training package consists of a text and an instructor's guide. It was developed by the Tennessee Valley Authority, based primarily on the agency's experience, for resource practitioners from developing countries.

V. L. Pandas, Rats and Nukes: China's Environmental Problems

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Three major areas of concern to contemporary Chinese are: (1) striking a balance between rapid economic development and the preservation of wildlife habitat, (2) more effective rodent control, and (3) the conservation and rapid expansion of energy resources.

Wildlife Habitat

China's efforts to set aside and enlarge natural areas to help preserve its endangered species is most often drawn to the attention of the western world through China's giant panda. Adopted as the symbol of the World Wildlife Fund, it has become a focal point for the preservation of endangered species worldwide. Commemorated this year in China on a series of postage stamps, coins, hotel logo and countless T-shirts, the panda is viewed by many Chinese as a national resource and a leading tourist attraction. A recent book by George Schaller, The Giant Pandas of Wolong, (University of Chicago Press, 1985) and a National Geographic TV special about the panda drew attention to its diminished food supply and the urgent need for preserving the species through the retention of more natural habitat. The arrow bamboo, the panda's major food source, is being carefully planted and tended. It requires eight to ten years, however, for seed of bamboo dropped by dying plants to restore the forests and be a useful source of nourishment for the giant panda. (China Daily, Nov. 5, 1984).

Often throughout the 1984-85 year, articles appeared in the China Daily emphasizing the increased worldwide efforts to understand and provide for the needs of the panda. Since 1976 when 134 pandas were found dead, primarily because of starvation, Chinese scientists have published their views of the need for the preservation and restoration of wildlife habitat.

Rescue measures for the sick and weak animals, and increased research regarding appropriate nutrition, seem to have turned the tide, according to several articles. No longer is the panda a prime candidate for extinction. According to a China Daily article in the August 30, 1985 issue, at the Baisuijiang Nature Reserve in Gansu Province new bamboo shoots are growing well this year on 1,400 of the 3,300 hectares on which the bamboo withered previously. In addition to this increased potential food supply, the birth rate is up. Four pandas have been born so far on this reserve and appear "quite fit", according to the scientists in the observation posts set up to monitor them.

Even in captivity and in countries like Mexico, far removed from the high altitudes and bamboo forests of China, healthy panda cubs are being born. In the Mexico City Zoo, two offspring of a pair given by China to Mexico in 1975 are reported to be alive and well. This breeding success, according to an October 10, 1984 article, is even more remarkable because Mexico City's 60-year-old zoo is small, overcrowded, obsolete, and surrounded by one of the most polluted cities on earth.

Not all of the news regarding the giant panda is as optimistic as the accounts above. Although 21 sick and starving pandas located on a 200,000 hectare Gansu Reserve were saved this year, six more of those treated died. Another 21 were found dead in the wild. These statistics draw the attention of many to the urgent, growing need to retain the natural habitat of the panda, scattered over 45 mountainous counties in southwest Sichuan and northwest Shaanxi and Gansu provinces. Within China there are about 1000, mostly living on reserves. Fourteen of the 23 given by China to other countries have survived.

Other measures reported to preserve the welfare of the giant panda include a loan program. Reluctant to continue to give away the rare animals, two of those in the Fuzhou Zoo in Fujian were scheduled to travel on loan for a four-month exhibition in nearby Hong Kong.

China spends four to five million yuan, approximately 1.4 million dollars annually for rescue operations that are expected to last at least ten years. (China Daily, Oct. 11, 1984).

Fortunately for other endangered species, the international concern expressed for the giant panda has given momentum to a movement in China to increase conservation zones. By 1990, China plans to establish almost 500 nature preserves. As of October, 1984, 133 zones covering more than 8 million hectares had been established to protect virgin forests, rare animals, and places of geological interest. Of 30,000 plant varieties, about 200 are rare species, including silver fir, metasequoias, and Chinese pines. Ten percent of the world's vertebrates are in China, including the rare golden monkey and Chinese alligator.

In southern China's Yunnan Province, the Chinese government in 1982 expanded a nature reserve from 40,000 to 200,000 hectares, imposed fines on poachers, and provided compensation for damage to crops and injuries to domestic animals caused by wild species in the reserve. By November 1984, the reserve's local administrative office estimated that elephants numbered about 200 and wild oxen, 1,000. Since it is China's only elephant habitat, this preservation effort is a significant improvement. Other wild animals found there include the South Asian tiger, clouded leopard, gibbon, peacock, mouse deer, and civet cat.

On this reserve, as on many, the Chinese are faced with an important educational challenge, the teaching of the local minority people to raise domestic animals instead of continuing to hunt wild and often endangered species. In this region, local people have also reduced the large-scale felling of trees and learned to drive away the wild elephants and oxen from the fields by beating gongs and firing guns into the air. (China Daily, Nov. 3, 1984).

A recent positive indication of China's continuing concern for the preservation of its non-reserve land appears in the September 14, 1985 issue of the China Daily under the headline "Bid to Stem 'Takeover' by Deserts." Over the past 25 years over-cultivation and over-grazing in arid and semi-arid northern provinces has created a serious threat of desertification for about 3.4 percent of China's land area, and has a direct bearing on the lives of 35 million people in 12 provinces or autonomous regions.

Preferential loans were granted by the state to households to afforest much of the sandy wasteland. As a result, since 1978 in one area of Shaanxi Province, green-covered and forest areas have been increased by almost 60 percent and wind speed reduced by almost 50 percent. An even more promising indication of China's concern about land reclamation and preservation is that the Institute of Desert Research has shifted its focus to protection and remanagement of desertified lands in northern China, and away from research on existing deserts. Scientists are increasingly encouraged to deal with existing, urgent environmental problems.

Rodent Control

Though 1984 was the Chinese year of the rat, it was celebrated not by massive conservation efforts but by a state sponsored campaign labeled by one of my former students as the "Ten Cents a Tail Campaign." One evening in 1984, as several colleagues and I walked along a dimly lit street on a university campus in Xian, one of the young men in the group dashed off into an alleyway near the kitchens. Stomp, stomp...could be heard. A minute later he reappeared, penknife and rat tail in hand. It was added to his collection of 22 tails to be turned in to a government rat-tail collection booth. The amount he received for the 23 tails, 2 yuan and 30 fen (cents) supplemented his monthly food budget by more than ten percent. It would allow him to purchase more than a dozen eggs.

Current estimates of the number of rodents that are alive and well in China exceed 4 billion, more than four for every one Chinese. In Shaanxi Province alone, it is estimated that rodents are responsible for the destruction of approximately 30 percent of the stored grain. According to the October 12, 1984, issue of China Daily, agronomists reported that, not withstanding this example of massive destruction, Chinese peasants killed 590 million rats nation-wide in the preceding year, thereby saving five million tons of grain.

A creative Hunan peasant found an innovative use for the unwanted creatures. He caught 23,000 rats with an electronic device in the 1983-84 year and fed his fourteen pigs partly with powdered rat meat. His pigs gained weight at the rate of 0.75 kilograms a day. (China Daily, Oct. 18, 1984).

Cats, considered bourgeois and dispensable during the decade of the Cultural Revolution (1966-76), are again being recruited for the war on rats. At the Xian Free Market in 1984, a cat, when available, sold for fifteen to twenty Chinese dollars (yuan), an amount equivalent to almost half a month's salary for a beginning teacher. The China Daily of October 5, 1984 reports: "Cats are being bred to spearhead a nationwide war on rats in China. Already 2400 have been sold in the country's first cat farm," run in Jilin Province by a 22-year-old former teacher. He opened his animal farm in July, 1983, in response to the nationwide call to stem the tide of "big mice," as the Chinese call them. In 1982 rats infested 20 million hectares of crops, 33 million hectares of grasslands and 200,000 hectares of forests.

Another entrepreneur attempted to recycle a portion of the burgeoning rodent population by using their skins to stuff mattresses. His small factory, fortunately or unfortunately--depending upon your viewpoint--folded.

A widespread effort to educate the Chinese in effective methods of rodent control continues. In addition to poisons, traps, and bounties, improved rodent-resistant storage facilities are being developed. Garbage disposal methods are being improved. Since the late 1970s and the introduction of China's "new economic policy," many private households are engaging in the sideline occupation of rodent control.

As the panda symbolizes China's concern for the preservation of more natural habitat, the rat symbolizes to many Chinese the ecological mistakes of the past. The wholesale destruction of cats a decade ago and the widespread slaughter of birds in the 1950s are viewed now as major but not irreversible mistakes. Aware that the balance of nature is "out of sync," many Chinese scientists are attempting to restore it in a wholistic, comprehensive fashion. In the same way that the Chinese approach medicine from the viewpoint that both the physical and psychological aspects of an illness must be considered by doctors as they restore nature's balance in each human being, many natural and social scientists approach environmental problems from a similar wholistic viewpoint.

Nuclear Power

In regard to the development of nuclear power, the Chinese have decided to move ahead rapidly. Inexpensive, clean, efficient sources of energy are very high on their list of priorities. Pressure is growing from the 50 percent of the population under 21 for more opportunities for education, improved housing, and above all, jobs. In Xian it was estimated by one of my colleagues that at least 30 percent of young people who had completed their secondary schooling were "waiting for jobs." Only one in ten thousand has the privilege of attending a college, institute, or university. In order to meet people's basic needs, provide a higher living standard, and push ahead in the four modernizations (agriculture, industry, science and technology, and the military), increased energy resources are considered essential.

In August 1985 it was estimated that, in spite of widespread energy conservation efforts, 20 percent of China's existing machinery lay idle because of power shortages. Forty percent of rural households did not yet have electricity. (China Daily, Aug. 12, 1985).

China's power production has lagged behind its industrial development. In the first half of 1984, the gross output of industry was 11.4 percent more than in the same period of 1983, while power increased only 7.3 percent. During the same period, water reserves in reservoirs at hydroelectric stations were below normal by 25 percent, compared to 1983. Forty billion kilowatt hours were needed in 1984 to meet requirements of production and daily life. (China Daily, Oct. 8, 1984).

By the year 2000, China plans to double its energy output. In order to help attain this goal, China has drafted plans for building ten nuclear power plants in eastern and southeastern provinces. Two of them are already under construction. Agreements for the peaceful use of nuclear energy have been signed with several countries, including the U.S., Brazil, France, West Germany, and Italy (China Daily, Oct. 8, 12, 16, 1984).

The October 16, 1984 issue on page one carried an article titled "Development of Nuclear Industry to be Stepped Up." China's redoubled efforts to make nuclear power one of its major energy resources are discussed. Some of the reasons given for their decision to increase the emphasis on nuclear energy include: (1) The uneven geographical distribution of energy resources; sixty percent of China's coal reserves are in north China, seventy percent of its hydroelectric power is in the southwest, and over half of its oil is in the northwest. (2) Positive research results. Recent Chinese research on fast neutron breeder reactors has moved along more quickly than expected. By the end of this century, they plan to construct an experimental fast breeder reactor. An experimental high-temperature gas cooled reactor is scheduled for the late 1990s.

Concern for nuclear safety appear in several China Daily articles. Zhang Shiguan, a Senior Engineer of the Technical Information Institute of the Chinese Ministry of Nuclear Industry, wrote one titled "The Key to Nuclear Safety." "Safety at nuclear power plants," he writes, "depends largely on their operators and supervisors. One of the major lessons learned from the accident at Three Mile Island in the United States was the need for more attention to be given to operators and supervisors of nuclear plants... But...nationwide enrollment trends for reactor engineering are down compared to the 1960s." Not only are enrollments down to 70-80 graduates per year, but many of these students are assigned to other types of employment in design, manufacture, and research organizations. "Only a few are left to train as power plant operators." They receive two more years formal training in classrooms, simulators, or on-the-job. "Minimal plant shifts should consist of at least five technicians," he concludes. "So among the greatest challenges facing the nuclear power industry is acquiring, developing and retaining adequate numbers of staff." No mention is made by the engineer of earthquake protection or nuclear waste disposal.

In November 1984, a front page article written by Li Xing, a China Daily staff reporter, enthusiastically proclaims, 'Chinese Scientists in Nuclear Energy Breakthrough.' "In the country's largest experiment of its kind, scientists have produced (on September 26, 1984) their first burst of hot, ionized gas plasma." Although controlled fusion power plants are not expected to be on line until the year 2025, by 1994 the Chinese expect to produce a new generation fusion reactor (that) will...produce sufficiently hot, dense and stable plasma to burn on its own. He concludes, "We have been lagging in the field," (i.e., nuclear energy) "especially in the construction of fusion experimental devices. But we will use the 'HL-I' to try to catch up with the rest of the world." (China Daily, Nov. 7, 1984).

Summary

The expression "catching up with the rest of the world" is one that I heard often during the 13 months I was in China. There was a refreshing eagerness on the part of young people to learn as much as possible about the world outside their borders and to escape the mistakes people in other countries made as they modernized. Why, they asked, did China lag so far behind an infant country like the U.S.?

Faced with serious environmental problems, the Chinese struggle to continue to improve their living standard without further destruction of scarce, often over-used resources. Many seem willing to sacrifice immediate material gains to preserve habitat. They strive to develop comprehensive programs of pest control and conserve energy as well as develop additional sources for it. Through future issues of the China Daily, I will continue to follow the paths of Chinese pandas, rats, and nukes.

SOURCES

Selected Issues of the China Daily, Volumes 4 and 5, published between October 4, 1984 and September 15, 1985.

Smil, Vaclav. The Bad Earth: Environmental Degradation in China. Armonk, N.Y., M.E. Sharpe, Inc., 1984. Source of information regarding China's Endangered Species.

V. M. Strategy for Environmental Education: An Approach for India

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India today is engaged in an enormous development effort. During 38 years of independence we have concentrated on building the country's economic infrastructure and dealing with problems of political and linguistic integration. Modern medicine has brought down death rates faster than education can bring down birth rates. The country faces a critical population problem. The population has doubled over the past 40 years, now standing at over 750 million people, roughly one-seventh of mankind. New technology, especially the development of high yielding varieties of seeds, has kept the country's food production ahead of its population. But many of the gains are far short of expectations. The combination of a rapidly growing population and a fast deteriorating environment has denied the expected benefits of growth to a majority of our citizens. The country's forest resources are being rapidly depleted. The needs of housing and industry have taken some of the most fertile lands away from agriculture or forestry. The disappearance of tree cover is most acutely felt in our hilly regions, especially in the Himalayas. Precious topsoil is being eroded and floods have had devastating effects on the plains. The disappearance of tree cover in the catchment areas of major dams has led to increased silting reducing the life of the reservoirs. The wildlife situation in the country came very close to disaster and we would have lost several important species had action not been taken in time.

Four thousand five hundred years ago, the Indus Valley civilization could boast of the first city that had a well-planned drainage system. Today, unfortunately, we cannot say the same thing about many of our towns. Water-borne diseases are a major component of the country's health problems. Industrial growth has not been without a heavy toll. Bhopal being the worst of it. Most of our cities have pollution levels far in excess of what is acceptable. The working class and urban poor are particularly badly hit, both in their work environment and in the places where they live--usually around the factories. India's rivers, so integrated with our culture and considered in many ways the ultimate cleanser, are themselves choking from effluents discharged into them.

In 1972 at the Stockholm Conference. Prime Minister Indira Gandhi proposed the framework for an environmental policy that would be consistent with the problems of development that a country such as India faced. Over the last decade India has been initiating programmes to bring environmental considerations into development plans.

Legislation has been passed for the protection of wildlife and forests as well as for the control of pollution both of the air and water. Policies on land use have received increasing attention. Several non-governmental agencies have highlighted local environmental problems. Action Groups sprang up as environmental awareness grew. Programmes aimed at school children, including the formation of Nature Clubs and organizing of nature camps, developed during these years. In 1980 the Government of India set up a Department of Environment to act as the focal agency for planning, promotion and coordination of environmental programmes in the country. The new Department started supporting a number of agencies in the field of research and monitoring. A few pilot projects aimed at creating environmental awareness were also begun. But the attainment of such awareness at the national level was possible only if a concerted effort was made using several agencies, both governmental and other, working together to form a network.

The task before the Department was stupendous. It was clear that the only way in which environmental considerations could get integrated with development plans was through widespread awareness about the environment and of man's role in shaping it, for better or for worse.

Environmental consciousness, sensitivity, and values need to be built up at all levels. Legislation without awareness and education cannot be effective. True understanding of the environment has to start at the school level; but simultaneously a wider community, both urban and rural, has to become aware. There is a need for special programmes focussing on specific target groups such as decision makers. The network of agencies that can tackle such a problem will have to involve schools, voluntary agencies, government departments, extension agencies, and teacher-training and other educational institutions. In order to manage such a programme there is need for a sustained effort at generating innovative programmes, developing appropriate educational material, testing and monitoring the effectiveness of the programmes, training personnel, researching and preparing basic reference material, using existing media of communication and experimenting with traditional as well as new media.

One of the strategies of the Department of Environment was to set up "Centres of Excellence" for research, training and education--centres that would play a pivotal role in strengthening the country's infrastructure and thereby its ability to deal with these issues. The Centre for Environment Education was proposed under this programme.

There has been a tradition in India, started by the Atomic Energy and Space Agencies, of building institutions around people rather than the other way round. The Nehru Foundation for Development had through its institutions, the Vikram A. Sarabhai Community Science Centre, VIKSAT, and the Centre for Health Education, Training and Nutrition Awareness (CHETNA), built up groups engaged in developing innovative educational programmes and material, conducting teacher-training programmes and using the audio-visual and mass media in the fields of science, mathematics, health, nutrition, and environmental education. These institutions had many experiences that could be shared amongst them and there was an obvious synergetic advantage which could be utilized for environmental education. The Nehru Foundation's associated activities, Sundarvan, a small animal and snake park, and Darpana, a centre for performing arts, brought in other opportunities that could prove very useful in devising an environmental education programme. The Centre for Environment Education was established in August, 1984 as an associated activity of the Nehru Foundation for Development with support from the Department of Environment, Government of India. Sundarvan became part of the new Centre.

Starting with a core group of 18 people taken from VIKSAT, the Centre, along with Sundarvan, envisages a staff of about a hundred people whose skills would include communication, design, subject expertise, training, technical and support functions. At VIKSAT an effective model of working together in terms of interdisciplinary groups to generate programmes on environmental education had been developed. We are trying to retain this method of working together though the institution is growing and its tasks are becoming more complex. This is in recognition of the fact that different professional skills and backgrounds are required in order to develop a successful programme. Typically a group would consist of a subject expert, a person familiar with the target group, a designer, and a writer. The Centre is organized into the following groups:

Children's,
Urban,
Rural,
Graphic Design and Visual Communication,
Exhibit Design,
Writing,
Reference and Resource, and
Sundarvan--a nature discovery centre.

During its first year the Centre has planned and begun working on a number of programmes, while recruiting staff and establishing the required facilities. The current programmes of the Centre can be broadly classified into the following seven areas:

(1) Children's Programmes
(2) Sundarvan Programmes
(3) Urban Programmes
(4) Rural Programmes
(5) Interpretive Programmes
(6) Publications/Exhibits/Films and TV Programmes
(7) Training Programmes

Children's Programmes

There are over 625,000 primary and middle schools and about 50,000 secondary schools in the country, with a total enrollment of over 110 million students. They range from the sophisticated urban schools with modern equipment and facilities to single-teacher schools in rural areas where children in four grades or more share a classroom. Instruction across the country is in over 20 languages.

In some ways any attempt at developing uniform education programmes and material for a country so diverse is bound to run into difficulties. While it might work in one region in one set of circumstances, it would be inapplicable in another. On the other hand, an attempt at studying, analyzing and developing material for the different situations of Indian schools would mean that the Centre would only be able to design for a few such situations. Therefore, we are exploring a different concept of design.

The saree is a designed piece of clothing worn all over India. Over the years very beautiful designs, patterns and textures have been printed and woven into the Indian Saree and yet, several thousand years of Indian history has not tried to stitch the saree. It is worn in many ways and fits all sizes. It is equally good for working, dressing up or sleeping in. The final effect is the combined effort of the person who designs the cloth and the person who wears it--of the designer and the user. This is a very different concept from that of designing, say, a well-stitched dress. The garment either fits or doesn't fit and, where it fits, leaves little room for the wearer to be innovative in its use.

Our educational designing would have to be somewhat like the saree, more a tool than a finished product, a tool that comes alive in the hands of each teacher, its application being the combined effort of the designer and the user.

How does one translate this concept into educational media? We were recently working on designing an educational activity around a pond. A chart with an illustration of the pond is used with this activity. An attempt at preparing a ready chart, however beautifully done, had problems. It looked like one pond but not at all like the next one. One approach being developed is to make sheets with illustrations of individual elements like insects, shrubs, birds, fishes, trees, people, cattle, etc. The making of the chart using these elements and adding to them where necessary, rather than just using the chart, would become a classroom activity. The elements would be selected to show a category rather than a specific species. The chart made in the classroom would now not only look more like their own pond but the preparation of it would itself be an effective observing and learning activity.

Another question that the Centre faced was to seek appropriate media that would be cost-effective in an Indian context. We could consider educational material at a variety of levels--from material for each student to classroom material, to school material, to material for a cluster of schools, or to an even larger unit. If there were 50 students in a class, one had to think whether preparing 50 copies of single-use student material at say Rs. 2/-each was going to be more effective or classroom material that might cost Rs. 300/-and last at least three years; whether it was better to give teaching aids or only instructions as to how to make them. At the Vikram A. Sarabhai Community Science Centre at Ahmedabad, a mathematics teaching aid was developed for primary school children. The gadget might have been much too expensive had an attempt been made to manufacture and sell it as a finished product. Instead, the centre decided to develop a booklet and a teacher-training programme on how to make the teaching aid using low cost material. The programme was very successfully implemented at a number of schools.

There is another aspect to the dissemination of teaching aids which needs mention. The way the school system in India is organized today, many teaching gadgets end up locked in cupboards. The material are alien to the teachers, who are afraid that if they lose or break any part of the gadget, they will not be able to replace it. They thus end up not using it at all. Teaching aids developed by the teachers and students themselves do not have this problem and have better chances of being used.

A third aspect that we have to consider is the logistics of working in so many languages. We have decided that we would like to try out our educational programmes nationally right from the beginning rather than develop them based on one region. We are therefore experimenting with printing the graphic material in large quantities and letting the teacher or a State level organization put in the words through less expensive printing techniques or in some cases by hand.

The Centre has decided to focus its attention over the next few years on standards V to VII (age group 10 to 12). We felt that at this middle school level, children would have acquired basic skills and concepts in language, mathematics, and science and at the same time were not so pressurized with examinations that the teacher would be unwilling to participate in new educational activity. Later we would expand our programmes and develop material for both the primary standards I to IV and secondary school VIII to X.

Testing such educational material is a difficult task for, not being a product, its treatment will vary from situation to situation. Its effectiveness depends as much on the teacher as on the material. Teacher training thus becomes an important component for the effectiveness of the Centre's Programmes. At the first level, which we call lab testing, we bring students to the Sundarvan facility and the educational staff try it out themselves. At this level we are concerned mostly with the question of whether it works, whether it is interesting and how long it sustains children's interest at different age groups. At the next level a programme is tried in 10 schools around Ahmedabad. This constitutes our first trail with teachers conducting the programme. We study the variations in the programme in different situations. At this stage we are trying out the programmes in three languages--Gujarati, Hindi, and English.

The Centre is in the process of developing a network of 1000 schools across the country. These schools are being selected on the basis of their motivation and record of interest in innovative educational work. They may have started a Nature Club, have participated in one of the many programmes of the Department of Environment, be associated with the voluntary agencies dealing with education or have worked in areas other than environment and shown their interest in innovative ideas. Teachers from these schools will participate in teacher-training programmes and will receive the educational material developed by the Centre. This will then be tried in their school but, as mentioned earlier, not in a passive way, but through the active involvement of the teacher. In this sense this part of the process is not merely a trial but is very much a part of the development process itself. Over a few years, it is hoped that each of these schools will itself become a centre generating new ideas and, acting as a lead school, spread them to schools around it. NGOs and government agencies working in the field of education, such as the National Council of Education, Research and Training (NCERT), and the State institutions of education will also be intimately involved at this stage of programme development and trial.

Motivated groups of students have Nature Clubs in many parts of the country. The World Wildlife Fund-India has played a pioneering role in establishing Nature Clubs and running Nature Camps. Five regular camping programmes are being run--one each in a desert, a marine park, a scrub forest, a dry deciduous forest and in the hills. These programmes have proved very effective in firing the imagination of children and in inculcating love for nature. There is a need now to go beyond this level and to add a deeper understanding of the environment amongst the students and to develop skills of studying and appreciating the environment. The Centre is developing educational material for use at such camps and by students who have joined Nature clubs. The Centre itself plans to develop a Young Naturalists' Club for students who want to do small research projects in their own environment. Activity sheets, observation cards, and guidebooks and handbooks are being developed. Such students in the future could form a core constituency for any environmental action group or programme. For places where Nature Clubs do not exist, the Centre is also preparing material on how to form Nature Clubs and training programmes for Club Organizers.

Sundarvan Programmes

Some 54,000 people visited a week-long snake show organized in Ahmedabad in October 1978 by the Vikram A. Sarabhai Community Science Centre in collaboration with the World Wildlife Fund-India and the Madras Crocodile Bank. Seventy volunteers talked to the visitors about snakes and their importance in the ecosystem, answering questions based on the many myths and beliefs that surround this animal. The tremendous success of this show and others held around the country demonstrated the potential of using snakes to begin an enquiry into nature. It underlined the need for a permanent facility where one not only could see animals but understand them.

In the wake of this experience, Sundarvan was established in 1979 as a small animal park with a modest collection of snakes and small animals that children could get quite close to. In the first few years, the park has attracted visitors of all age groups. School groups have come for general and specific programmes. Sundarvan has participated in making documentaries for television on themes related to animals. Regular snake shows are arranged and at times a new animal has been on display. Film shows on wildlife and nature are held over weekends. Snake shows have also been held in rural areas around Ahmedabad.

Sundarvan today is part of the Centre for Environment Education. The park facilities are being developed with new animals and birds. The selection is being made on considerations of the educational value of the enclosure rather than whether the animal is exotic or a novelty. Emphasis is being laid on creating natural viewing situations in the park. Mango trees and a pond have attracted fascinating birds. The pond was our first attempt at creating a natural viewing situation. Another shallower pond is being built for wading birds.

The Centre is initiating a programme for young naturalists in the age group 13 to 19. With the growth in Nature Clubs, it was felt that there is a need for programmes for the motivated students involving more detailed and focussed observation of the environment. Simple research projects are being drawn up and these will be sent to students who join the Young Naturalists' Club from all over India. Through correspondence and a newsletter these programmes will be communicated to the network of students who will be able to write back their experiences to be shared with others.

Sundarvan gets several calls from in and around Ahmedabad from people who have spotted a snake and want it caught rather than killed. Usually there is a crowd gathered when the snake catcher arrives and it forms an ideal occasion to inform people about snakes in general and the snake caught in particular. A simple pamphlet on snakes is distributed.

In a more formal sense an outreach programme of taking small animals to schools is being developed and the initial trials using frogs, mice, turtles and non-venomous snakes have been very successful. A series of educational flip charts and other teaching material have been developed to aid this programme. This outreach programme can be undertaken at several centres in the country. We are contacting agencies that would be interested in taking up such a programme and training their educational staff in conducting it. The flip charts are being made with the illustration screen printed and a guide for writing-in the text in the local language.

We are trying to utilize the existing snake charmers in the country to present a more scientific view of snakes without, of course, making their show less entertaining. A rural snake show with a mobile exhibit using snake charmers as extension staff is being developed.

Urban Programmes

The urban environment in India is characterized by phenomena common to cities in most large developing countries. Foremost among these is the high growth rate of population. This is due as much to natural increase as to rural-urban migration resulting from the incapacity of the impoverished countryside to support an increasing population on a narrow resource base. The familiar stresses attendant upon this phenomenon--overcrowding, slums, inadequate services, an informal sector all but fugitive from the law providing marginal employment to a sizeable proportion of the population, environmental pollution--are compounded by some features unique to India.

To overcome these formidable problems it is necessary to create an educated opinion among all segments of the urban population who are affected by the situation or are in a position to influence the course of urban development. Towards this end, over the past few years, we have been running an urban programme trying to focus people's attention on planning issues that have a major environmental implication and on areas where action was called for. By running a magazine, using the popular press, organizing public seminars and workshops, and through a mobile exhibit, we have tried to create an awareness both at the community level and amongst decision makers and administrators. Our experiences has shown that while people understand the issues, there remains a basic credibility problem. There are many who think that there are no alternative ways of planning. Many feel that cost factors for any such environmental programmes would be prohibitive. There are those who think that the difference would, at best, be marginal. Under these conditions, it was felt that we needed to talk in terms of specifics, highlighting cases where environmental improvement has been achieved. As a follow-up of this, we are working on creating demonstration projects in which a communication intervention can lead to a major environmental improvement of the area and can be used as an example at the national level. Seven such projects have been selected. These deal with problems such as urban open spaces, development of waterfronts, the environment of the market place, the environment of the urban poor, and the preservation of a monument within an urban area. The national relevance of the project would not be in terms of the solution adopted but rather in terms of the approach. Relevant Government and voluntary agencies are being identified for each project. Communication material is being developed aimed at the local community and the relevant decision makers. Once the project can be successfully carried out, a much wider reaching communication effort would be undertaken. A national level seminar is being organized on some of these issues inviting people from other towns and cities to share their experiences and give details of the demonstration project.

At a very different level, an urban awareness programme in the form of activities titled "Know Your City" is being developed for use in schools.

Rural Programmes

With increasing population, rural India faces a major shortage of natural resources on which the life of the village depends. Firewood and fodder are two areas where the stress is particularly severe. The increasing pressure on these resources leads to overutilization making the long-term problems even worse. Overgrazed lands become susceptible to erosion leading to lesser production of fodder in every successive year.

Efforts at both increasing production and making more efficient use of available resources are required. Many techniques have been developed but their dissemination is slow and at times does not lead to the desired result. The government has launched several schemes which remain unknown to the intended beneficiaries. Many innovative programmes started by NGOs remain confined to the small cluster of villages where the agency works.

The Centre´s rural programmes aim at developing effective communication strategies for the dissemination of environmentally sound technologies, processes and programmes. There is a large network of voluntary agencies as well as government field organizations in the country. The Centre´s strategy is based on working with this network and developing communication programmes that can be used by the existing network rather than attempting to directly communicate with the end-beneficiaries. Two specific programmes have been selected for the initial years. Both these deal with the severe shortage of fuelwood and fodder in the country. Several versions of a smokeless chulha (a wood burning stove) have been developed in India and tried with varying degrees of success. The chulha is stated to reduce the requirement of fuelwood by about 40 per cent. However, in many places where it has been introduced, women complain that while it reduces smoke, the chulha increases the requirement of fuel. The problem has to do with developing the right design for the right application. Initially, two pilot communication programmes are being carried out, one in an area where chulhas are to be introduced, and the other where they have already been introduced and certain problems relating to their use have to be dealt with.

India has vast areas of land which have been laid waste through overexploitation. The country has given the development of wastelands a major priority and a Wastelands Development Board has been set up at the national level. This is another area where most of the technical problems have been solved. But the logistics of involving people in planting fuelwood species is preventing rapid greening of these areas. The Centre, in collaboration with VIKSAT, is collating information on a variety of basic and functionally pertinent topics such as how to form a cooperative, what tree to plant, how to find finance for the project, etc.

While natural resources have rapidly deteriorated, the position is particularly critical for people who live in and around a sanctuary or a national park. With such areas coming under 'protection' the entire resource base of many of the people living around these areas has become out of bounds to them. For tribals who have been relocated outside such areas, there is the further problem of adjusting to a new environment. This has created hostility between the tribals and villagers on the one hand and the park authorities on the other.

A programme directed at bringing about a new relationship would consist of identifying the existing needs and available resources, exploring possibilities of augmenting these resources and modifying the needs, evolving educational components to create awareness about the need for the sanctuary, and management of the sanctuary and tourism so as to benefit the people of the surrounding areas.

A pilot project is being developed around a wildlife sanctuary in Rajasthan.

Interpretive Programmes

India has over 200 national parks and sanctuaries, over 2000 important historical and cultural monuments and about 100 botanical and zoological gardens. During a visit, people want to know more about what they see and this is the right moment to impart environmental messages. An interpretive programme that can make people understand the various aspects of the place and their relationship to the surroundings is an important method of creating environmental awareness amongst the general community.

It is very important to understand the spirit in which the visitor comes to see a park or a monument and to evolve educational components which do not seem to be an imposition. The programmes involve identifying the right message and selecting an appropriate medium for it. The visitor must feel that the information provides answers to the questions in his mind.

Earlier, as VIKSAT, the group developed an exhibit area for the Gir National Park and educational material for the Bandipur Sanctuary and other tiger reserves in the country. The group had also worked closely with the National Museum of Natural History, New Delhi, in developing Take Home Labels. Today we are engaged in developing interpretive programmes for the Kanha National Park in Madhya Pradesh and the National Zoological Park in New Delhi. These are being developed in collaboration with the U.S. National Park Service.

One of the most challenging tasks in this project is the development of suitable material that can stand the onslaughts of weather and at times vandalism. The media will include pamphlets, road-side guides, exhibits at museum and waysides, signage, audio-visuals and other non-print media.

More than a million people visit the Delhi Zoo every year. The programmes undertaken in this park will enable visitors to gain a better understanding of the animals in the Zoo and the role that the Zoo plays in the country's conservation efforts. The work involves designing and fabrication of a signage system, wayside exhibits, an illustrated information folder, a handbook and a visitor centre.

The interpretive programme for the Kanha National Park is being developed as a model for such facilities at national parks and sanctuaries. This visitor centre will be housed in an old dak bungalow, built during the British period. Part of the exhibit area will be on the research in the national park. This will not only show the results of the research but will also try to elaborate on the process by which these results were obtained. For instance, an exhibit describes what a tiger eats through displaying the method of collecting the information. Other media designed for Kanha are a roadside guide, a handbook, a tabloid, pocket cards and wayside exhibits.

Publications/News Service/T.V. Programmes

There is a great dearth of basic reference works and popular books on environment and related subjects focussing on the Indian context. The Centre has, therefore, taken up a programme of publishing a series of handbooks and field guides and books specially designed as supplementary reading for students. The first twelve of these--on the birds, mammals, trees, etc. of Gujarat State--are being published in collaboration with World Wildlife Fund-India. A series of four illustrated books on India's natural resources is also being published. With increasing environmental awareness there is need today to provide information on what an interested person can do to participate fruitfully in the conservation movement. To meet this need, the Centre proposes to publish catalogues providing comprehensive and relevant access information. The first of these is an Indian Wildlife Catalogue.

While a dozen national dailies and periodicals have been giving increasing coverage to environment-related stories in recent times, the vast majority of Indian newspapers in different languages pay little attention to the environment. One reason for this is that there is no centralized agency in the country which regularly supplies environmental news and articles to the press. The Centre has, therefore, started an environment News and Features Service. Through this service we provide authentic information to over a thousand dailies and periodicals in the country. Much of this information is a by-product of the various programmes of the Centre. The service offers a weekly package of news, features, articles and photographs.

The Centre will be establishing basic audio-visual facilities next year and will be developing programmes in the non-print media. Television is becoming a major medium of mass communication in the country. Special educational telecasts have also commenced. The centre has proposals to develop a regular programme on environment for television.

Training Programmes

The Centre's overall approach is to work through existing networks. This would involve working with teachers, members of voluntary bodies, field workers of government agencies, educational staff at national parks and sanctuaries as well as at museums and zoos. In order to make any such programme successful, training programmes are essential. At present, the Centre envisages training workshops of about five days each. But besides the function of training and making people familiar with educational material developed by the Centre, the programmes will be very useful as a forum for exchange of ideas and experiences. The people trained by the Centre, in turn, become another network that will be useful in disseminating ideas on environmental education, programmes and material throughout the country and getting feedback on programmes carried out.

Conclusion

I have tried to outline the strategy for environmental education that is being developed by the Centre for Environment Education at Ahmedabad to fulfill an important function at the national level. The basic components of this strategy are:

1. To help national networks for environmental education and to work with the existing networks both for the purpose of development and trial which can be a simultaneous process;

2. To use both modern and traditional media and to experiment with innovative communication ideas for the promotion of environmental awareness;

3. To develop educational material intended for widespread use in a way in which the user can adapt it to particular situations. In this sense, to develop the material more in the form of a tool rather than a finished product;

4. To develop for implementation through centralized agencies programmes which may be in the form of very clearly defined projects and programmes with a large training component for the relevant educational staff;

5. To use existing situations and develop interpretive programmes around them;

6. To use successful environmental programmes and build communication strategies around them and to develop demonstration projects where, through a communication intervention, a major environmental improvement can be shown;

7. To demonstrate the efficacy of communication programmes in terms of the requirements of diffusing specific technologies and processes.

There are many experiences and approaches from all over the world that are relevant to the Indian situation. Whenever I have discussed with colleagues from various parts of the world, aspects of their programmes, one becomes all too aware of how global some of the underlying issues are. We would, therefore, welcome suggestions, comments and inputs in terms of experiences and insights as well as in terms of specific ideas as we develop material for India.

V. N. Population Growth in North America--Need for a Continental Strategy

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Background and Population Policy

The Continent of North America embodies the developed nations of the United States and Canada, as well as the lesser developed nation of Mexico. Vast common borders exist between Canada, the United States, and Mexico which have provided opportunities for net migration exchanges between nations. North America and Canada uniquely possess the highest population growth rates of the world's developed nations, while Mexico ranks high among the lesser developed nations. Cultivated land, and population densities vary greatly among these member nations. For example, the United States with a mid-1985 population of 238.9 million, currently cultivates 20 percent of its total land area, while Canada with 25.4 million utilizes a mere 5 percent due to its northerly latitudes. Mexico with current population at 79.7 million cultivates 12 percent and has a population doubling time of 27 years, compared to 90 to 100 years for Canada and the U.S. respectively.

Since the three nations occupy a common continental land mass, it is of interest to explore whether population policy, explicit or non-explicity, exists within these nations. Objectives of explicit policy deal with changes in population size (births, deaths, migration) and distribution or composition (sex, age, race). For example, international migration policies can affect a nation's sex ratios and racial and ethnic composition. When national population policy is explicit, it directly attempts to influence demographics and indirectly affects variables related to social and economic factors. However, no nation to date has a comprehensive population policy that effectively integrates all social and economic factors. During the last two decades, there has been fairly widespread adoption of explicit national population policies related to growth rates. As an example, in the 1950s growth reduction policies were instituted in India and China. In contrast, pronationalist policies exist in only a few nations including Africa, Brazil, and Argentina. A few governments such as the U.S. and Canada have resisted adoption of any over-all or explicit population policy (Nortman, 1973). However, family planning programs are supported by these nations. Cultural mores, poverty, religious taboos, and ideologies can offer impediments to development of explicit population policy in both developed and less developed nations. Foreign advocacy of population planning can cause resentment in lesser developed nations or among minorities when varied ethnic groups are involved. Marxists have argued that socialism, not population policy, is the cause for social and economic ills. Or, in some cases, governments have incorrectly argued that military strength is associated with population size. (Policies on Population...)

United States

The earliest elements of explicit population policy became evident in 1969, when the first U.S. President sent a population message to the U.S. Congress. In response, in 1970, the Congress set up a special commission on Population and the American Future, and enacted the first comprehensive Family Planning and Research Act. In 1973, abortion was recognized as legal by a landmark decision of the U.S. Supreme Court.

In 1975, United States population reached replacement level (2.1 children/family). However, replacement level is not to be confused with stabilization or zero growth. As an example, in 1981, a record net addition to the U.S. population of 2.3 million was made. This was the highest of any developed nation (1.7 million of this was natural increase or the differential between births and deaths; the remainder was due to legal and illegal immigration). Although fertility is currently lowest in history, annual births are up from 3.1

million in the mid-seventies to 3.6 million in 1980 and 1981. (This represents an "echoboom" of the post World War II baby-boom. The number of women of childbearing age constituting the post World War II baby-boom is at a record high and the birth rate is at the lowest in history). Immigration had been 420,000/year in the 1970s and jumped to 750,000 in 1980 ("U.S. Population..." 1982). The Cuban Mariel Boatlift, the political exodus of S.E. Asians, and Salvadoreans, have made up the difference. The legal quota from immigration is 400,000/year with quota for emergency refugee situations set at an additional 200,000. Total immigrants admitted in 1983 were 559,763. Interestingly, emigration has increased to 100,000/year in the United States, although emigration and immigration have greatly vacillated in this country. Emigration patterns often relate to prior problems of immigration in the United States."...Emigration of non-U.S. citizens has been a significant component of U.S. population dynamics" (Warren, 1985). Since the turn of the century, the ratio of immigration to emigration has been 3 to 1. Between 1900 and 1980, 30 million legal immigrants entered the U.S., but 10 million left. Often, immigrants have left disillusioned or chose to return to their nation of ethnic origin, or even more to unexplored Canadian frontier. One-third apparently settle in Canada or Mexico. European countries rate second in choice. Emigration, however, plays a more important role than was formerly thought. While Census Bureau estimates have indicated emigration to be 40,000/year, actual analysis of the 1980 census has indicated figures of 160,000/year, during the 1970s.

Persons who move out of the United States do so not only unnoticed, but also unrecorded. A close look at emigration trends alters our perception of the impact immigration has on U.S. society. The facts appear to contradict the notion that everyone wants to move to the United States, but no one wants to leave. It is not surprising that some portion of the immigrant population eventually departs. A relatively new phenomenon appears to have gained momentum over the past few decades: U.S. citizens also are emigrating in increasing numbers. A review of emigration from the United States, despite limited data, indicates that immigration is accompanied by substantial counterflow, and that the number of U.S. born persons living abroad has increased sharply in recent decades. What does this movement mean to our society? Recognizing and measuring the emigration of former U.S. immigrants would allow U.S. immigration policy to become more flexible and responsive to changing circumstances. Since...the annual level of admissions has been based on the concept of gross, rather than net immigration.

Canada

Canada, with a mid-1985 population of 25.4 million, occupies a vast territory, second only in size to the Soviet Union, with only 5 percent of its land mass utilized for agriculture. A unique feature of Canada's population picture is its high level of concentration in a small proportion of the total land area, the Windsor-Quebec axis, and Vancouver. This axis occupies 2 percent of the land area but as an urban cluster contains 55 percent of the country's total population. "The population's heavy concentration in limited geographic areas has important political and economic consequences for the country" (Beaujot, 1978).

Canada's population has also experienced changing age structure similar to that of the U.S., due to the post World War II baby boom, although its growth rate has consistently exceeded the U.S. An oversupply of students created a short supply of teachers and facilities in the 1960s. As the baby boom left school, it became a formidable force on the job market, causing higher unemployment, lower expectations, and economic difficulties. As this group becomes Canada's aging population, an enormous challenge and serious problems are posed. Canadian history is one based on high immigration of English and French, Protestants and Catholics, which remain the dominant social and political groups. Only the poorest of 1861-1900 saw a net emigration to the United States. Canada's population has continued to grow faster than other developed nations due to high immigration and large family size of the French population component. The country's population is projected to reach 35 million by the year 2000 based upon an average family size of 2.5 children/woman and 100,000 net migrants/year (Barrett, 1977).

High birth rates of early French colonizers may be tied to monetary inducement, abundant new land, a need for a workforce, and no major catastrophes. Another theory is that high French fertility can be attributed to competitiveness felt by the French as a minority group lacking social awareness for mobility. It is possible that the group felt that increase of numbers would give greater weight in the society by "la revanche des berceaux" (revenge of the cradles). However, in the last two decades the French Canadian fertility has dropped precipitously. Legal emigration to the U.S. in 1984 was 10,781 and 11,390 in 1983. Before 1975, the borders were very open, flow was mostly to the U.S.A., the exchanges became of concern to Canadians. Since 1970, Canada has become increasingly attractive to U.S. residents (Beaujot, 1978). A new Immigration Act of 1978 may be the first component of population policy.

Mexico

Mexico, one-quarter the size of Canada, or 14th in land area of the world's nations, has three times the population of Canada, with mid-1985 population estimate of 79.7 million (1985 World Population Data Sheet). Its population doubling time is just 27 years, although its growth rate is exceeded in Latin America by Nicaragua, Honduras, and Guatemala. In 1519, Mexican population of native Indians was 4 1/2 to 25 million, and was reduced to one million soon thereafter by imported Spanish disease (Nagel, 1978).

Following the 1910-20 revolution, most Mexicans saw population growth as a necessary part of economic development, compared to many deaths during the revolutionary period. Textbooks mimic this philosophy. The pronationalist government directly and indirectly encouraged population growth. Advertising promoting use of contraceptives and abortion was forbidden. The government offered prizes to the most prolific mother of the year. The General Law of 1947 legally empowered the Secretary of the Interior to take steps necessary to resolve "national demographic problems," including "measures to encourage marriage and to increase the birth rate" and immigration. Officially, the government's policy was that more is better, or that as long as the rate of economic development could keep ahead of population growth rate, the quality of life would improve. This view was shared by most of the elite and by demographers until the 1960s when the population had overshot even high demographic projections. Between 1940 and 1978, Mexico's population tripled from 20 million to 67 million. Foreign observers began to stress in the late sixties that a one-third decrease in Mexico's birth rate would improve human welfare. The Mexican experience was a paradox for those who held the demographic transition as a prevailing population regulation mechanism (Coale, 1978). although the Catholic Church has been perceived as a major obstacle to family planning, its role on public policy in the 1960s was indecisive since 35 percent of the Mexican population either practices no religion or is ignorant of basic elements of the religion. By the 1970 presidential election, it was evident that Mexican unrestrained fertility plus declining death rate was threatening the nation's welfare. A Family Planning Program, near institution, was eliminated in the election presentation by the new president Echevarria. His pronatralistic stand may have been designed to appeal to the left. However, in 1972 Echeverria announced start-up of a massive national family planning program via the General Population Law of 1973. Mexico now uses media and its national school system for population and sex education. Textbooks utilize clear comparisons and illustrations. By 1972, 42 percent of Mexican women were using contraceptives. In the cities, the rate rose to 61 percent (Nagel, 1978). Mexico's current very low death rate is due to 47 percent of the population being under 15 years of age and is in dramatic contrast to the United States. The World Bank has estimated that Mexico might reach replacement fertility level in the year 2020. The population would grow from the present 80 million to 254 million in the year 2075 (World Bank, 1978). Only 16 percent of the land is arable. Most of the population is concentrated between two spines of the Sierra Madre Mountains. About 17 million persons occupy Mexico City, which has surpassed Tokyo as the world's most populated city (Nagal, 1978).

Rampant population growth and uneven income distribution are causative factors for illegal emigration into the United States. Nowhere else in the world does such a vast (2000 mile) border exist between a developing and developed nation. Legal immigration from Mexico into the U.S. was 59,079 in 1983 and 57,557 in 1984. From the 1980 census, it has been estimated that 2 million Latin Americans are living in the U.S. illegally and that 45 percent or 900,000 persons are Mexicans (Warren, 1985).

Summary

These three North American nations could benefit by creating a select Joint Council on North American Population Affairs. Much of the history of population problems has been repeated by each nation. Outside objective observers can often pinpoint adverse trends approaching a nation. Furthermore, the history and contemporary problems of the nations deal with emigration and immigration across vast borders. Mexico's population growth is inexorably tied to enormous growth and distribution, migration, and exacerbation of environmental problems. It is just possible that a continental approach toward population policy might facilitate more expedient resolution of some of these plaguing problems. But such a council would require unique membership of individuals trained and knowledgeable in demographic trends, as well as tuned to the delicate diplomacy required for such an approach.

Why is the concept of a continental North American population policy of importance from an educational point of view? First, within the continent of North America exist examples of the two types of global population growth. The first is manifest by the two most rapidly growing developed nations of the world--Canada and the U.S.--each super consumers of global energy and other resources. Canada's current growth mimics patterns of the U.S. historically, allowing students a glimpse of the past. Mexico illustrates the plight of the developing nation with a high growth rate, and with a large percentage of the population unable to contribute to the economy.

Secondly, the extensive borders between these countries provide an excellent opportunity for research into the immigration component of population growth for given nations.

Finally, the proposal to create a select Joint Council on North American Population begins to create global perspectives as opposed to insular national thinking. The population problems within the continent of North America are simultaneously national and international in nature.

REFERENCES

Barrett, M., and C. Taylor. 1977. Population and Canada (Toronto: Guidance Centre, Faculty of Education, U. of Toronto.)

Beaujot, R.P. April 1978. "Canada's Population: Growth and Dualism", Population Bulletin, 33(2), Population Reference Bureau, Washington, D.C.

Coale, A.J. 1978. "Population Growth and Economic Development," The Case of Mexico," Foreign Affairs, 56(2):415-429.

Davis, et al. June 1983. "U.S. Hispanics Changing the Face of America". Population Bulletin, 38(3). Population Reference Bureau, Washington, D.C.

Nagel, J.S. December 1978. "Mexico's Population Policy Turnaround". Population Bulletin, 33(5). Population Reference Bureau, Washington, D.C.

Nortmann, D. 1973. Population and Family Planning Program: A Factbook; Reports on Population/Family Planning. Population Council, New York.

"Policies in Population Around the World", Population Bulletin, 29(6), Population Reference Bureau, Washington, D.C.

Statistical Yearbook of the (U.S.) Immigration and Naturalization Service 1983.

Stone, L.O., and A.J. Siggner. 1974. "The Population of Canada, A Review of Recent Patterns and Trends." (Paris: Committees for International Cooperation in National Research in Demography.)

"U.S. Population: Where We Are: Where We're Going." Nov. 2, 1982. Population Reference Bureau, Washington, D.C.

Warren, R. and E.P. Kraly. March 1985. "The Elusive Exodus: Emigration from the United States." Population Trends and Public Policy. Number 8. Population Reference Bureau, Washington, D.C.

World Population Data Sheet, 1985. Population Reference Bureau, Washington, D.C.

V. O. Impact of Large Scale Developmental Activities on the Environment of a Tribal Region: A Case Study of Dandakaranya Project in India

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> In the Dandakaranya, where magnificent trees are crowned with sweet fruits and where fruits and roots are in plenty, you (the development) are roaming. Who are you? We want to know your true nature. (Srimath Valmiki Ramayana, Aranya Kandam.)

Dandakaranya is a legendary territory mentioned in the ancient Indian epic, Srimath Valmiki Ramayana. It lies in the Central India. The territory is bordered by the railway line running from Nagpur via Raipur, Visakhapatnum, Vijayawada, Warda, and Nagpur. However, developmental activities on the initiative of Central Government have begun over an area of 66080 sq. km covering the District of Bastar in Madhya Pradesh and Koraput in Orissa State. This is a tribal area and one of the most backward regions of India.[1]

Initiation of Developmental Activities in Dandakaranya

In spite of its backwardness and unhabitable environment, Dandakaranya had always attracted immigrants. As early as 1930, the immigrants from Rangoon, as a result of anti-Indian riots, settled in this region. In the 1950s, the Government of India chose this as one of the areas for settling the refugees from East Pakistan.

In order to help the displaced persons settle in a hostile environment, in July 1958 the Government of India constituted the Dandakaranya Development Authority. Besides the resettlement of refugees in reclaimed lands, the Authority was assigned the tasks of area development and promotion of tribal welfare. In this task the other wings of the Government of India, Madhya Pradesh and Orissa, have contributed their shares.[2]

A brief review of developmental activities in the Dandakaranya

In the early years of the project, about 350 kilometers (220 miles) of metalled road, along with a large number of link roads, were completed. A railway line of 320 kms (200 miles) from Vizaianagaram to Bailadilla, has been commissioned.

As on December 1984, about 36,500 families were rehabilitated. However, a few families have since emigrated from this area. The number of families living at present is 25,153. Various facilities and financial help were provided to the settlers. Effective steps have been taken to eradicate malaria. Trees were felled over an area of 355 sq. kms. and lands were made suitable for cultivation. The number of villages newly opened up was 103.[3]

Although the rainfall over this region is adequate, about 1500 mm., it is mainly concentrated in four months. So special attention was given to the development of irrigation. Irrigation potential created up to June 1984 was 91,395 hectares.[4,5,6]

Iron ore, manganese, quartzite, and graphite are mined in the Dandakaranya region. The debris from the mines, washed down by the surface runoff into the streams, posed health hazards to the tribals, who drink water from these polluted streams either from ignorance or from the non-availability of drinking water from other sources.

The only large-scale industry in this region is the Aero Engine Factory at Sunabeda, near Koraput. The other small-scale industries are mainly agro-based and service-producing industries.

Environmental Impact. The major impact of all these activities is the sustained reduction in the forest cover. The extent of this change is disguised in official statistics. Recent advances in remote-sensing techniques help in monitoring such changes. The satellite imageries of 1972-75 and 1980-82 were visually interpreted.[7] Least disturbance to the forest cover area is noticed in the western part of Dandakaranya. Significant change in forest cover area is noticed in three areas taken up by Dandakaranya Development Authority for development.

The reduction in forest cover area from 1960-62 to 1970-71 is 2.2 percent (from 47.2 percent to 45.4 percent).[8,9] This does not reflect the qualitative changes in the forests. In Bastar district, where detailed forest statistics are available, 24.6 percent of the total area is under "scientifically managed" forest areas. Another 17.4 percent of the total area is proposed to be brought under scientific forest management. Another 26.9 percent of the total area is wasteland.[10] There is thus an immense scope to improve the forest cover with the help of the tribal people.

Rainfall trend. It is argued that reduction in forest canopy can have adverse effect on rainfall. This is tested by analyzing 68 years annual rainfall data for Jagdalpur, which is the only observatory having a long period of reliable rainfall data.[11,12] The normal rainfall in an year at Jagdalpur is 1570 mm. The average rainfall for the period 1910 to 1977 is 1536 mm (Table 1).

Table 1. Decadal averages of annual rainfall at Jagdalpur.

Decade	Av. Rainfall mm.	Decade	Av. Rainfall mm.
1911-20	1534	1951-60	1523
1921-30	1711	1961-70	1415
1931-40	1586	1971-77	1508
1941-50	1441	1910-50	1570
		1910-77	1536

It can be seen from the table that during the last four decades, Jagdalpur on an average had less than normal rainfall.

Development and the tribal people of Dandakaranya

One of the immediate impacts of development is the growth in population.

Table 2. Decadal percentage growth of population in Dandakaranya.

Decade	Growth	Decade	Growth	Decade	Growth[13]
1901-1911	26.9	1931-1941	18.6	1961-1971	30.4
1911-1921	-0.35	1941-1951	14.2	1971-1981	21.6
1921-1930	15.5	1951-1961	25.0		

The decades of 1931-41 and 1951-71 have witnessed a substantial increase in the population of Dandakaranya (Table 2). The population of Dandakaranya in 1981 was 4.33 million--1.84 in the Bastar district and 2.49 in the Koraput district.

The status of the scheduled tribe in this region is given in Table 3.[14] The scheduled tribe constitutes 61 percent of the total population: Only 6.8 percent of the tribal population are literates. 31.4 percent of them are cultivators, 10.2 percent agricultural laborers. Other and marginal workers constitute 11.8 percent of the tribal population. Tribal population engaged in household and other works, which can be considered as gainful employment, is only 2.1 percent. This shows that the benefits of development is only marginal to the tribals.

Table 3. Status of Scheduled Tribe in Dandakaranya, 1981

Sl. No.	Characteristics	
1.	Total Population in millions :	4.3
2.	Persons - Scheduled Tribe :	2.5
3.	Percentages of Scheduled tribes to the total population	61
4.	Literates	6.8
5.	Main workers	43.7
6.	Cultivators	31.4
7.	Agricultural laborers	10.2
8.	Household industry	0.3
9.	Other workers	1.8
10.	Marginal workers	10.0
11.	Non workers	46.3

Majority of tribal population (42.6 percent) are dependent on agriculture. Did the tribal people derive benefit commensurate to the increase in cultivated area and irrigated area? Available data do not indicate that it has happened.

By June 1984, the created irrigation potential was 42,720 hectares. However, the utilization was only to the extent of 16,505 hectares, amounting to 39 percent of the created potential. The net irrigated area during the year 1983-84 was only 15,892 hectares. No where in India such a low irrigation intensity is found.

The cropping pattern has changed in favor of more food crops. This change is viewed as a breakdown of a tribal economy which has produced all major items of consumption within the region. Moreover, the rise in food crop production has not been in proportion to the area shifted to it, allowing the productivity to fall. This calls for a rethinking on the concept of development through agricultural growth in tribal areas.

In this respect, a knowledge of the tribal mind would be useful. "The forest is in the tribal mind and their way of life is centered around a tree" (Dom Moraes). Can the intimate knowledge and love of the tribes for the trees be translated into action which may turn more than one fourth of the Dandakaranya land which now lies waste into productive forest lands? How to educate and organize the tribes in this task? In finding answers to these questions lie the prosperity of the tribes centered around trees and the conservation of the environment in this region.

The Government of India and the State Governments of Madhya Pradesh and Orissa have initiated in this direction Integrated Tribal Development Programmes. Madhya Pradesh was the first to start a Department of Environment. But the tasks ahead are enormous and complex. In the words of Dom Moraes:

> It is simplistic to think that if electricity flares in the forest and clean water fills canal, the development phase is over. Enmeshed in continual complexities, it has only begun. All dreamers (of development) realize when they wake that fulfillment is always one dream away.

REFERENCES

[1] Subramanian, V.K. 1969. Dandakaranya - A Changing Landscape. The Indian Geographical Journal, Vol. XLIV, p. 44-59.

[2] Senapathi, U. 1969. Gazetteer of India: Orissa, Koraput Bhubaneshwar, District Gazetteers' Department, Orissa, Government.

[3] Data collected by the Author; field work in December 1984.

[4] Dandakaranya Development Authority. 1984. Note on Irrigation works in Dandakaranya Jagdalpur.

[5] Government of Orissa. 1984. Minor Irrigation Statistics, Koraput District.

[6] Superintending Engineer, Irrigation Circle, Jagdalpur, Bastar. 1984. Irrigation in Bastar (in Hindi), p. 17.

[7] National Remote Sensing Agency. 1983. Mapping of Forest Cover of India from Satellite Imageries 1972-75 and 1980-82, Summary Reports on Madhya Pradesh and Orissa.

[8] Government of India - Bureau of Economics and Statistics. All India Land Use Statistics. 1970-74.

[9] Government of Orissa - Bureau of Statistics & Economics. Statistical Abstract of Orissa, 1979.

[10] Misra, G.K., Kundu, A. 1979. Rural Electrification in Bastar and Chandrapur, A perspective Plan for Regional Development. Indian Institute of Public Administration, New Delhi, pp. 55,56 and 63.

[11] India Meterological Department. 1972. Monthly and Annual Rainfall and Number of Rainy Days, Period 1901-50 - Part. I.

[12] Government of Madhya Pradesh, Directorate of Land Records, Table of Rainfall Recorded in Rainguage Stations in M.P. for the years, 1951 to 1977.

[13] Census of India 1981. Primary Census Abstracts. Orissa and Madhya Pradesh.

[14] Census of India 1981. Paper 2. Orissa and M.P. Scheduled Castes and Scheduled Tribes.

V. P. International Environmental Education: The Myth of Transferability

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The United States enjoys a long and diverse history of environmental education (EE). Each "school" (nature appreciation, conservation education, environmental awareness, natural resource management, extension, etc.) has its historic roots in a perceived need that has produced a new specialization. Today in the U.S., "environmental educator" can mean someone who: interprets nature; teaches ecology; educates people in environmental management; or encourages people to appreciate and enjoy their natural environment. He or she can work in a school, a nature center, a national park, or a Soil Conservation Service Office, and thus may have one of several possible agendas. These agendas are often so different from one another that it is a common complaint among environmental educators that a coherent definition of the field is not possible.

Environmental Education in developing countries springs from different roots than does EE in developed countries. The unavoidable presence of severe environmental problems and the recognition that practical solutions are urgently needed has led developing countries to focus on a highly applied and practical form of environmental education. Many people in developing countries realize that wise environmental management is necessary for achieving development objectives. Therefore, developing countries are looking for ways to use education as a tool better to enable a wide range of audiences to make appropriate decisions in response to various environmental issues. These countries cannot afford to specialize in one "school" of environmental education, particularly one that does not focus on environmental problem-solving.

As developing countries are becoming increasingly interested in implementing environmental education programs, U.S. educators are finding themselves more and more involved in assisting in the design and implementation of such efforts. Unfortunately, many U.S. practitioners tend to encourage the implementation of specific U.S. programs because they are familiar, not because they can best address a country's unique environmental, political, and social characteristics. This tendency to consider only a limited range of educational strategies in developing countries is reinforced by the compartmentalization of U.S. environmental educators into the various environmental education schools of thought. With minimal familiarity and even disdain for the objectives and techniques of the other schools, the educator frequently fails adequately to appreciate how an array of environmental education strategies must be applied in developing countries. Thus, if one educator has worked with, say, nature centers in the U.S., all too often he or she can be expected to begin setting up similar centers in other countries without first considering whether such a program should be the first priority for that country's budding educational effort.

Because of this specialization and narrow focus it can be very difficult to locate an environmental educator with the broad perspective and experience needed to provide technical assistance to a developing country. For example, one of the authors recently tried to locate a technical advisor to work with a private environmental organization in Ecuador that was developing a national environmental education program. An intensive search was made. Telephone calls to universities, advertisements in newsletters and a review of a computerized roster of 1500 environment/natural resource management specialists produced only a handful of names acceptable to the Ecuadoreans. Although the requirement of Spanish fluency was a limiting factor, the real problem was the specialization of U.S. environmental educators and their training and experience in one particular school of EE.

The Ecuadoreans had designed an environmental education program that used several strategies (mass media, school curricula, seminars, special events, posters and others) to reach the general public, schools, government decision-makers, industry and rural communities. Very few of the U.S. candidates had experience covering more than one strategy, let alone in a variety of settings with several audiences. The candidates' understanding of natural resource areas was broad, but they often brought expertise in only one particular educational method. Eventually the Ecuadoreans had to draw on several different short-term specialists to meet their needs.

The Ecuadorean case is unusual because the people designing the environmental education program, although they were not trained environmental educators, had a sure idea of what they wanted to achieve in environmental education and a general idea of how to proceed. Thus, they were able to assess for themselves whether or not the U.S. specialists and their approaches would be transferable to the Ecuadorean situation. In many developing countries this is not the case, and the countries are more vulnerable to implementing a U.S. model that is not relevant to their needs. In these cases we feel strongly that it is the responsibility of the U.S. environmental educator to look objectively at country needs and be extremely circumspect in advocating any one U.S. model or recommending the use of U.S.-designed materials.

The Process

To assist U.S. environmental educators in this task and better to enable developing countries to design environmental education programs tailored to their needs, the authors have developed and implemented the following seven-step process. The process is logical and simple, so much so that it may seem unnecessary to devote a paper to describing it. It has been our collective experience, however, that such a systematic process has rarely been applied to the design of environmental education programs in developing countries. Rather, educators have frequently designed programs based more upon their own preferences and experiences, using U.S. media and materials rather than adjusting to the reality of the cultural, political, and environmental circumstances of the countries where they have worked. The consequence has been that the potential of many environmental education programs in developing countries has not been realized.

Step 1. Identify the environmental problems to be dealt with by the education program. A clear understanding of each problem, its causes and impacts, is essential before a successful program can be designed.

Step 2. Identify the changes needed to solve these problems. The ultimate goal of a developing country's environmental education program should be behavior change, not attitude change. Attitude change will only be the means to the end, not the end in itself. Each education program, then, will have as its goal the implementation of measures that will improve environmental management. Therefore, the changes to be advocated have to be identified before the program can begin.

Every environmental problem to be focused upon by a developing country's EE program should:

1. Be directly significant to the people the educator is serving. Thus, an EE program would not prepare bird identification guides while farmers' fields are eroding away.

2. Be capable of being effectively addressed by the EE program. Not every serious environmental problem should be an EE target. For example, it will be fruitless to educate a farmer to stop cutting a tropical forest if there is not an alternative to the cutting that will meet the farmer's needs equally well. Some other technique--law enforcement or financial compensation, for example--would have to be used instead to achieve the desired environmental result.

Step 3. Identify the target audience. Broadly speaking, there are at least four different categories of potential target audiences for the EE program:

1. People directly affecting or capable of affecting a natural resource, either positively or negatively. Examples: farmers causing soil erosion, people capable of planting trees, etc.

2. People capable of indirectly affecting how natural resources are treated. Example: government officials who make policy, make and enforce laws, finance resource management efforts, etc.

3. The general public. (In a problem-specific EE program, awareness programs for the general public are of limited usefulness--particularly if the country is not a voting democracy where influencing the political system is possible through public education. Usually, targeting smaller audiences as in above is more effective).

4. School children. (Again, problem-specific EE emphasizes targeting the audience that can directly do something about the problem. However, efforts to raise a future generation's environmental literacy can help head off future problems and are frequently good investments--particularly if designed to teach students how to identify environmental problems and correct them, rather than teaching broad generalities).

The target audiences ultimately chosen for the EE program will have to fit two criteria. First, they should be the most capable of contributing to the implementation of the changes targeted in Step 2. If a public cannot contribute to solving the selected environmental problems, the EE program should not be targeted at them. For instance, the Somali Ministry of Agriculture in January 1984 was interested in beginning an EE program that would reduce wildlife poaching in that country. One idea was to develop school curricula that would teach school children in the capital city about the value of their country's wild animals. This strategy was rejected because the people doing the poaching were nomads who never went to school and who essentially lived free of government control. Ultimately, it was decided that poaching was not likely to be solved through education in the schools; instead, the resources available for EE programs were directed towards village reforestation and soil erosion control efforts.

Secondly, the targeted audiences should benefit from adopting the behavior changes advocated by the program. An EE program cannot be expected to convince people to behave in a way that they perceive is contrary to their interests. The situation in the Somali refugee camp of Luuq can illustrate this. By December 1983, refugees had harvested so much firewood that the thornbush desert around the camp had become a baking barren. Women who collected the wood had to devote an entire day to gather what their family needed. Yet, a USAID-funded effort to reforest the area had to pay refugees to plant trees. Why? Because Luuq was considered to be a temporary place to live, and the refugees had no idea when they would be forced to move. They certainly did not expect to be in the area for 5 more years--the 5 years required for the planted seedlings to mature to a harvestable size.

Step 4. Identify the Message. The first step in determining program content is to learn why people are behaving in a way that needs changing. To do this, the point where target audiences lie on the following continuum needs to be determined. Are the audiences:

1. Aware the environmental problem exists?

2. Aware of the problem, but not aware of their relationship to it--how it affects them and how they are contributing to it?

3. Aware of the problem and their relationship to it, but not aware of its solution?

4. Aware of the problem, solution, and what they should do, but not convinced that changing their behavior will benefit them (not motivated to take action)?

Depending on the audience, it may not be necessary to begin at point "1." Wherever the educator begins, however, it will be necessary to move the audience along the rest of the continuum through point "4" to obtain positive results.

Once the point on the continuum is established, the message has to be designed to move the audience along the continuum and motivate it to adopt a certain behavior. Thus, it has to be tailored so that the audience understands how the behavior change can be beneficial.

For example, since 1978 the New York Zoological Society has sponsored an effort to protect the Mountain gorilla in Rwanda and its habitat in Volcanoes National Park. One critical goal of the program has been to reduce poaching and timber cutting within the park. To this end, the program delivered two messages to people living in the park's vicinity:

1. That the gorillas attracted considerable foreign tourism important to the local economy;
2. That the forests ensured a clean and reliable water supply essential to local agriculture.

By featuring these two themes in EE programs, it was possible to gain the support of the locals so that they would take action to help reduce poaching and timber harvest.

Step 5. Choose the education strategy, media and materials. Many possible strategies exist, from school curricula to mass media to extension programs to one-on-one encounters with government leaders. They vary in costs, time and resource requirements. To be appropriate for an EE effort, the strategies chosen need to be capable of effectively reaching the target audience and effectively communicating the program's message. If the target audiences and message have been already determined, the appropriate strategy for the EE program may be obvious. However, cultural, religious, and political considerations must be integrated into any education strategy chosen, and factors such as literacy, availability of technologically sophisticated equipment, etc., must also be carefully considered.

Step 6. Program Implementation.

Step 7. Evaluation. One by-product of this process is that it provides a clear and convenient way of evaluating the education program. Simply stated, the program is successful if it has made progress in changing a preselected environmentally significant behavior (as described in Step 2). It is not successful, even though it may be enjoyable, clever, accurate, or attractive, if behavior has not been affected positively.

Conclusion

Environmental problems in many developing countries are acute, and innovative solutions are badly needed. Since many of these problems are solvable only through actions by knowledgeable, motivated people, environmental education can play a key role in the developing world's desire for ecologically sustainable development.

However, EE in developing countries must be based on local needs, meshed with the political and cultural realities of these countries. Methods and materials from the United States are of limited use in these situations because many are not problem-specific or are too narrowly focused on North American ecology and infrastructure.

A more relevant approach, rather than adapting U.S. programs and materials, is to start with a basic analysis of the problem and continue with a planning process which will create an EE program uniquely applicable to that situation. Assistance in helping developing countries implement this EE planning model is likely to pay higher dividends than attempts to transfer existing programs and materials from the U.S.

VI. Presentations: Educational Research

VI. A. A Sustainable Future Means "Non-Sexist" Environmental Education

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Introduction

A variety of environmental programs has developed as America's concern for wise use of natural resources has increased. A number of these programs have been evaluated in terms of attitude and/or knowledge changes (1, 3, 4, 6, 9). Reports of evaluation attempts often indicate that significant gains were made in terms of pre-post testings. But, as Carlson and Baumgartner (4) pointed out, further study should be conducted to establish what background factors contribute to these changes.

An analysis of the West Virginia Forest Industries (WVFI) Camp's data (1, 3, 6) was undertaken to determine if the variable of gender had any significant effect on the various tests that had been given during past years. The null hypothesis was that no significant (.05) differences would be related to the variable of gender.

The one-week West Virginia Forest Industries Camp's staff teaches environmental education in a camping atmosphere with specific emphasis placed on the Eastern Hardwood Forest ecosystem and the knowledge that it can be used to produce the goods and services required by people without destroying or degrading its contribution to the environment. Topics included multiple-use, injurious agents, and social action processes. Selected campers were predominantly rural youths between the ages of 16 and 20. Every applicant had to be recommended by a forester, teacher, or other youth leader. West Virginia University and the forest industries of West Virginia sponsor the program. The program's goal is to develop a fundamental philosophical attitude that views the environment in which people live as a total system that has as its major component a natural system upon which are imposed the social, political and economic systems.

Method

Each year, the first and last day of camp has involved testing, typically attitude and knowledge tests. During 1979 and 1980, however, some other tests on expectations, enjoyability, perceived amount learned, and the perception of camp's organization were also administered (3). The attitude instrument contained 16 Likert questions with 5 response foils ranging from strongly agree to strongly disagree. A panel of three experts was used in 1975 to establish the validity coefficient of .92. Earlier publications have reported the reliability and validity figures for the attitude and knowledge tests (1).

Initially one year, 1980, was selected to pilot-test the hypothesis. That year was selected since it was the most recently completed data set and more tests were given than usual. The camp data sets were separated by gender and then analyzed by group "t" tests. Since the 1980 gender analysis looked promising, the procedure was repeated with 1979 camp data, which matched all the tests given in 1980. There were some different findings between the two years, so the gender groups were combined to increase the sample size. A third year, 1976, was then added. That year was the first year females were included in the program, but only attitude and knowledge tests had been administered.

Results

These three years contained a total of 117 camp participants who completed the various tests. There were a total of 71 males (25, 22, and 24 from 1980) and 46 females (11, 12, and 23 respectively). Both gender groups made significant (.05) gains between the pre- and post- attitude and knowledge tests. When the 3 years were combined, there were only two significant between-gender differences; the females were lower on the knowledge pre-test and the females made significantly greater gains between the two knowledge tests (knowledge difference factor). There were no significant gender differences on the knowledge post-test or on any of the other tests.

Discussion

An environmental or natural resource-based program concerned with imparting the greatest amount of knowledge might want to consider (1) adding females (as did the WVFI's Camp in 1976), (2) accepting a greater number of females (only 40 percent on the WVFI's Camp for the combined 3 years were female, although roughly 50 percent were in 1980), or (3) developing special programs for those who are the lowest scorers. It is possible that the individuals scoring lower on the pre-test keep the camp program pitched at a lower level. A pre-test could be given before the program with follow-up information to help bring the lower scorers up to average before the actual program begins. In that way, some common starting ground could be established, thus saving time during the actual program.

Perhaps the most important question to be raised from these results is, "why are the females scoring lower on the pre-knowledge test?" There is good evidence to support the explanation that sexism in the classroom and America's socialization of sex stereotyping prevents females from developing interests and knowledge in science related areas plus prevents them from developing those traits which would lead to success. The Sadkers (7), after reviewing the literature and conducting their own studies, concluded that (1) girls are less likely to take math and science courses and that (2) girls are often short changed in quality as well as in quantity of teacher attention. In general, teachers in the 80s still favor boys. Boys receive more attention, more encouragement, and more detailed instruction. Vocally, boys dominate the classroom. Another extensive review of the literature by Golden and Hunter (5) reported that females "are not socialized to succeed intellectually or professionally." Differential achievement was hypothesized by Smith (8) to exist because of schools reinforcement of "feminine," non-achievement-oriented qualities. Textbooks were found by a group, Women on Words and Images (10), to contain a very strong bias against girls.

Typically, female career possibilities have been considered to be more restricted than the range open to males. A child learns during school what is appropriate and inappropriate for one's own sex.

This week camp was primarily associated with forestry; forestry is a field dominated by male images. Some national symbols of forestry are Smokey the Bear, Ranger Rick, Woodsy Owl and Paul Bunyan. Wilderness and mountains are associated with Jeremiah Johnson. Even Bambi is a male.

Women are underrepresented in natural resource fields. In 1980 males accounted for slightly over 75 percent of the degrees granted from forestry related programs and schools (2). It seems, then, that school personnel and youth organizations have a responsibility to give equal opportunity and equal support to females. Society will benefit from a more knowledgeable citizen and career areas will benefit from a larger applicant pool.

While the females did score higher on the attitude post-test, their increases were not significantly (.05) greater than the males. It would be wise to evaluate a given program for several years, especially if the numbers of participants were low, before dramatic program changes were automatically passed on from year to year. Sometimes a finding can occur during only one year, with a given set of participants. Only one year, 1979, was no significant difference found between male and female pre-knowledge test scores.

REFERENCES

[1] Bammel, Lei Lane. 1978. Information's Effect on Attitude: A Longitudinal Study, The Journal of Environmental Education, 9(4):41-50.

[2] Burrus-Bammel, Lei Lane. 1982. Responsibilities of Educators in Forestry: Special Emphasis on Females, Minorities, and Foreign Students. Proceedings of the 1982 Convention of the Society of American Foresters.

[3] Burrus-Bammel, Lei Lane, William E. Kidd, and Gene Bammel. 1980. Expected Consequences, Enjoyability, and Other Evaluation Scales, In: Current Issues VI: Yearbook of Environmental Education and Environmental Studies. National Association for Environmental Education, pp. 301-317.

[4] Carlson, John E. and David Baumgartner. 1974. The Effects of Natural Resource Camps on Youths. The Journal of Environmental Education, 5(3):1-7.

[5] Golden, Gloria and Lisa Hunter. 1974. In All Fairness. Far West Laboratory for Educational Research and Development.

[6] Kidd, William E., Lei Lane Burrus-Bammel, and Gene C. Bammel. 1978. Evaluation of One Environmental Education Program, The Journal of Environmental Education, 10(1):12-15.

[7] Sadker, Myra and David Sadker. 1985. Sexism in the Schoolroom of the 80s. Psychology Today, 19(3):54-57.

[8] Smith, M.P. 1972. He Only Does It to Annoy... In: S. Anderson (ed.), Sex Differences and Discrimination in Education. Worthington, Ohio: Charles A. Jones Publishing Co.

[9] van der Smissen, Betty. 1975. Research Camping and Environmental Education. Penn State HPER Series No. 11.

[10] Women on Words and Images. 1971. Dick and Jane as Victims: Sex Stereotyping in Children's Readers.

VI. B. A Photographic Content Analysis Technique of Measuring Attitudes Towards the Environment

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Every environmental agency or group occasionally produces printed documents--annual reports, advertising brochures, special events posters, informational flyers, news releases for the media, etc. What type of attitudes are expressed in the accompanying photographs? Is one type of environment emphasized more than others? Are certain parts of the population not represented as interacting with the natural environment? Does one gender appear to be more environmentally active than the other? What type of message is being conveyed by the photographs? Photographs can reinforce, contradict, emphasize, or detract from the written message.

Environmental attitudes have primarily been determined by questionnaires, surveys and interviews--all obtrusive methods of research. Besides the obvious reactivity, these methods have severe subject and event limitations (Burrus-Bammel and Bammel, 1984). An alternative, which can be used either in conjunction with obtrusive methods to cross validate results or alone, would be an unobtrusive method. Unobtrusive methods include (1) systematic observations, (2) physical traces, and/or (3) archive research. Archive material is either of a continuous nature, private and public records which are produced on a regular basis, or is episodic.

Content analysis is an approach to documentary research involving archive material, be it journals, television, newspapers, films, books, or other physical form of communication. Content analysis is the "systematic counting, assessing, and interpreting of the form and substance of communication" (Manheim and Rich, 1981). A few individuals have used content analysis of written messages to determine attitudes towards animals (More, 1977), natural environments like wilderness areas (Fazio, 1979), and toward management proposals (Stankey, 1972). But research investigating environmental attitudes through analysis of photographs and drawings is sparse even though news items accompanied by a photograph or illustration of some sort have been found to attract more attention from readers than those that are not (Manheim and Rich, 1981).

A preliminary investigation was undertaken by a team at West Virginia University in the Division of Forestry to determine what type of environmental attitudes might be expressed in photographs and to make recommendations based upon those findings.

Methods

Five steps are necessary in conducting content analysis research: (1) defining the population to be studied; (2) determining the sample, selecting which cases in that population shall be examined; (3) isolating the unit of analysis; (4) undertaking the substantive and/or structural content analysis; and (5) conducting the statistical analysis.

Two populations were used in this study, the Parks and Recreation journal and West Virginia's State Parks and Forests brochures. The first population represents continuous archive material and the second represents episodic. Three issues of the journal were randomly selected for the years 1967, 1972, 1977, and 1982, whereas all of the brochures that were available to the public in the Spring of 1985 were used. Therefore, a total of 12 issues of the journal, 18 State Park brochures (15 parks did not have brochures), 7 State Forest brochures (1 did not have a brochure), and 1 composite State Park and Forest booklet served as the sampled population.

Photographs served as the unit of analysis and the content to be analyzed was both substantive and structural. Structural analysis included size, while substantive focused on what was depicted--subject matter and internal relationships.

Categories and subcategories were established to serve as a tally or response record for each photograph or drawing. For example, the State Park and Forest categories included the type of environment (natural, natural modified, and artificial) with or without people, the type of people (gender, age, minority, handicapped, group size) relationships (dominant person, recessive person), interaction (with staff, other visitors, nature, etc.), type of activity, type of animal, and picture clarity. The journal included many of the above but also had some unique categories since it was a different type of document.

Results

There were 256 pictures (photographs and drawings) in the State Park and Forest material, 55 in the booklet, 180 in the 18 State Park brochures, and 16 in the 7 State Forest brochures. The environment category with the greatest number of pictures was "artificial" (N=102), followed by "modified" (N=90), and completed with "natural" (N=59). A picture classified as artificial was one which emphasized a structure such as a lodge, or was an inside shot of a building. The modified category included such things as golf courses, boat launch areas, and other outdoor scenes which contained non-natural elements such as a ski lift or groomed cross country trails. Twenty-three point five (23.5) percent of all the photographs were of natural, unmodified environments, and only 20.5 percent of the photographs contained in the State Park brochures were of that category. Over 40 percent of all photographs were classified as artificial, including 43.75 percent of those in the State Forest brochures.

People were shown sitting about twice as frequently as participating in any of the 28 different activities that were represented. The next four most frequently seen positions or activities were informal "play," hiking/walking, swimming, and sightseeing. These five activities accounted for nearly 60 percent of all photographs classified as containing people doing a given activity. Three of these (sitting, swimming, playing) were in the top five of each subpopulation (State Parks, State Forests, and the combined booklet).

Of the 180 pictures in the State Park brochures, only five (2.7 percent) contained animals; three contained horses, one of deer, and one of raccoon. One of the 16 State Forest brochure pictures contained deer, and one of the 55 pictures in the combined booklet contained horses.

One person who could be classified as handicapped and another who could be classified as a minority was found in the 108 people pictures in the State Park brochures. None were located in the other material. Seven of the 251 pictures contained elderly women and six showed elderly men; each gender was represented in less than 8 percent of the pictures. The elderly were always shown in a passive position, usually sitting and reading. Males were the dominant person 71 percent of the time in pictures containing two or more individuals. A dominant person was one that was larger or closer to the camera, one that was standing or positioned above the other(s), one that was physically handling the other, or one that was obviously in charge or control of the other. A male could be dominant over another male, as well as over women or children.

The State Park brochures were the only subpopulation of material to contain pictures of visitors interacting with staff. About one third of all the pictures were of questionable quality.

In the four volumes of the journal investigated, photographs and drawings of animals represented 7.66 percent of those pictures which did not contain people, nature shots represented 10.10 percent. In each volume males occurred significantly more often in pictures classified as headshots, key figures (dominant), and labor jobs.

Discussion and Conclusion

Based on the previous information, one could conclude that in West Virginia State Parks and Forests that senior visitors are passive, a wide range of activities exist but sitting is the primary attraction, visible wildlife is limited, males are dominant, and no interaction occurs with the staff in State Forests.

This is fine if this is really the case or if this is the image that the management wants to present to potential visitors. Photographs can collectively express an attitude to the viewer and new items with photographs have been found to attract more attention than those that do not (Manheim and Rich, 1981).

The State Parks in West Virginia contain a good number of deer, easily viewed in the evening on many of the golf courses. Visitors have been known to frequent certain parks because of this feature. Only 11.55 percent of the pictures showed visitor interaction with nature. Perhaps the state ought to make more of the wildlife in the various brochures. This is one example of how photographic content analysis could help determine what is being collectively presented to the viewing audience and then a decision to keep or change could be made, based on quantitative evidence. For example, one could question if the brochures in this study contained too many pictures of artificial environments? Are there too many pictures of people sitting? Should a picture of a person with limited mobility or an obvious physical handicap be included?

The photographs and drawings contained in the six issues of Parks and Recreation represented traditional stereotypes of men and women. The imagery gave the impression that men are, compared to women, more active, more important, more interesting subjects, more prevalent, stronger leaders, able to better operate large equipment, and receive more awards. Women, on the other hand, are more often than men to be handicapped, followers, passive, and used as objects of sex in advertisements. These findings do not seem in line with the expressed philosophy of the association which supports Title IX, Equal Opportunity.

Content analysis is a powerful assessment tool. It provides a means for evaluating whether words and pictures agree, if there is a discrepancy between what the words say and what the images express, as well as what type of attitudes are presented. Pictures do speak more clearly and more convincingly than words. Publications should be carefully reviewed to ensure that imagery is used effectively, and in keeping with the agency's avowed philosophy and purposes (Burrus-Bammel, Bammel, and Angotti 1985).

REFERENCES

Burrus-Bammel, Lei Lane, Gene Bammel, and Lisa Angotti. Assessing an agency's image: Sexism and beyond. Women and Forestry, 7(2):21-22.

Burrus-Bammel, Lei Lane and Gene Bammel. 1984. Applications of unobtrusive methods. In Peine, John (ed.), Proceedings of a Workshop on Unobtrusive Techniques to Study Social Behavior in Parks. U.S. Department of the Interior National Park Service, Southeast Regional Office, Atlanta, Georgia.

Fazio, James, 1979. Agency literature as an aid to wilderness management. Journal of Forestry, 77(2):97-98.

Manheim, Jarol B. and Richard C. Rich. 1981. Empirical Political Analysis. Englewood Cliffs, NJ: Prentice-Hall.

More, Tom. 1977. An analysis of wildlife in children's stories. In: Children, Nature, and Urban Environment. USDA Forest Service Gen. Tech. Rep. NE-30, 89-92.

Stankey, George H. 1972. The use of content analysis in resource decision-making. Journal of Forestry, 70(3):148-151.

VI. C. Teaching Critical Thinking Skills in a Natural Resource Context

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Undergraduates receiving instruction in argumentation in a course in natural resource and environmental history performed significantly better than controls on an open-ended test requiring evaluation of statements involving faulty reasoning. However, experimental and control group students' use of generalizations, value judgments, and personal experience in their evaluations indicate test item content tapped similar cognitive structures regardless of students' background and training. The relationship between ideological bias, vividness, and emotional salience of item content and failure to think critically was found to be complex.

VI. D. School, Community, and Culture

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A rich heritage still exists in rural Alaska creating exciting curricula and instructional possibilities. Also, having opened their doors just 10 years ago, village high schools are still in the process of developing, presenting Alaskan educators with an excellent opportunity to find ways for schools to develop their own identities.

At the same time, many external forces are influencing these schools as well, including transplanted curricula, teachers unfamiliar with the culture of the community, and school organization and classroom structure based on an urban middle-class model of schooling. Tension produced by an external model of schooling superimposed on a non-western culture may result in students with low academic achievement, and a high teacher turnover rate.

However, research on small schools, both in Alaska and in rural America, suggests that utilizing local resources and issues is one means for small schools to develop an identity. Research on Native American classrooms suggests that incorporating community norms into the classroom environment can increase motivation, involvement, and learning.

Following these lines of research, the University of Alaska and a village high school in western Alaska collaborated to design instructional strategies, new curriculum options, and ways of involving the community, in an effort to create more appropriate educational opportunities for these Yupik Eskimo high school students. The University team traveled 700 miles to work on-site with the teaching staff. This paper describes the first year of this on-going project and reports on the results of a formative evaluation.

Setting

The community is a traditional bilingual Yupik Eskimo village on the shores of the Bering Sea, and inhabitated by 550 people. Seasonal rounds of subsistence hunting, fishing, and gathering provide a significant contribution to the mixed cash and subsistence economy; commercial fishing accounts for the main source of cash income. The village, like many in rural Alaska, is experiencing rapid social change and severe pressure is being placed on the subsistence way of life. Conflicts between villagers and outsiders are on the increase as the resource base is shared between more and more users.

The Project

The goals of the project were to determine and create appropriate curriculum for small village high schools, and to develop instructional strategies which enhance the learning potential of these high school students. During the course of the school year the University team visited the school, observed classrooms, and conducted curriculum workshops. The culmination of this work was a three-week, collaborative, multi-disciplinary project, organized around subject matter chosen jointly by the teachers and their students. Four teams were formed, based upon the following themes: subsistence; kayak and boat building; songs, dance, and legends; and old villages (archaeology). The school day was also reorganized into large blocks of time, mornings being reserved for the regular curriculum and afternoons for "project time."

Methods

Four research questions guided the formative evaluation. They were:

1. What teacher-student and student-student interactions characterized the project?
2. What effects did the project have on community-school relationships?
3. What curricular topics emerged as appropriate?
4. What were the strengths and weaknesses of the project implementation?

The research was conducted by a team of University members and three local college students. The methods included participant-observation, classroom observations, interviews, and a student questionnaire.

Discussion

Teacher-student and student-student interactions. The classroom interactions were characterized by small group cooperative learning. Each project class altered their classroom environment, allowing for more student to student interaction. The frequency of student-to-student on task interactions increased eight fold (from .24 to 1.90 per observation period) during the course of the intervention. There was a high degree of peer instruction, particularly in the translating of English into Yupik, both prior to and during the intervention. The substance of student-to-teacher interactions changed from one of teachers' explanations, to students' questions about the content. When answering the question "What was good about your group?" 65 percent of the student respondents noted the advantage of working together. Cooperative learning was sometimes in evidence, while community members instructed about the Yupik culture. For example, "John held the students' attention, the classroom environment was totally altered, calmer, fixed attention, students on task, asking and answering questions (of the elder and each other)...Yupik was the language of instruction." Research supports peer learning as positive, under-utilized, and cost-effective.

Interestingly, when elders became the "teacher," the social organization of the classroom was significantly altered. The teaching reflected an authoritative style, yet students appeared relaxed; interactions occurred prior to and after elders told stories.

Community-school relations. The project's effect on community-school relations was difficult to analyze. From a strictly statistical analysis, the frequency of community participation in schooling increased dramatically as elders visited the classrooms on a regular basis, classes visited elders in their homes, and elders led field trips. However, during the first days of the project a few well-intentioned strategies on the part of the teachers to increase school-community interaction did so, but with negative results. The community judged a questionnaire that was about to be circulated as "prying, being nosy, being used against the people, and even as a way to make fun of, and profit from, the village." Public meetings held the next day in the school to discuss the overall project further exacerbated the rift between school and community, when some elders felt they had been insulted by students. Others resented not being paid for their efforts. The on-site project coordinator, a local staff member, resigned shortly thereafter. Another person stated, "teaching students our culture in school is threatening." Research in other indigenous communities has reported similar sentiments. Summing up, another community member noted "the project is the talk of the town and it is not positive."

The teaching staff persevered and began to negotiate more effective means of involving the community. Elders were repaid through reciprocal exchanges for their instruction, by students assisting in household chores, collecting and chopping wood, and bringing them fish. By the end of the project, some elders who wanted to participate in the program were turned down.

Curriculum. Just as involvement of elders and community members in the school received mixed reviews, so also was there no clear consensus on whether it was appropriate to teach local history, culture, and traditional activities in the school. For instance, as some community members noted, "Why are the teachers getting into this and not worrying about their regular school work?" Some teachers expressed a similar view, "If we are to have special projects, it should be within the expertise of the teacher. Are we not here to teach that which we are qualified to teach first?" However, the cultural nature of the content may not have been the cause of the negative feelings expressed by community members, but the fact that they felt excluded. The question may be the manner in which the content is taught and the perceived degree of congruence between the community and the school. Student respondents (85 percent) noted that they would like to learn more about their culture.

Those groups whose project included a product seemed to be most successful. Where concrete tasks were accomplished, student interest seemed higher, attendance was better, and student responses on the questionnaire were more positive. For example, one teacher noted, "the change was worth the accomplishment of the goal...we built a kayak." Another teacher said that "students had successes that they normally do not experience in school and feelings of accomplishment from completing their project."

The University's role--strength and weakness of the intervention. The University promised more than it was able to deliver, considering the amount of time and resources needed adequately to plan, develop, and assist in a project of this magnitude. The goals of the project changed at least three times during the course of the intervention, from a reading-oriented project to a small project to the entire high school. Also, clear lines of responsibility and authority were never adequately established.

Some teachers, community members, and university faculty believe that a successful project was begun. Concrete objectives were met; a major intervention occurred; and students and teachers gained more control of the curriculum and the organization of the school. Feedback from students noted that they were looking forward to being in the "project" next time. The school has since reorganized its day, allowing students more choice in the curriculum. Recently, the school has included a cultural journalism class, reflecting the project's goals. Finally, teachers had an opportunity to build collegiality by working with colleagues from other disciplines and grade levels.

Recommendations--year two of the project.

The necessity of developing appropriate high school curriculum, instructional strategies, and relationships with the community is a compelling reason to continue the project. The exciting potential of local issues and culture entering the curriculum is just beginning to be tapped.

Developing effective teaching strategies such as cooperative learning (peer instruction, cross-age tutoring, and student directed learning) needs further study. Studying these issues on-site, and using teachers as researchers, as well as University personnel and students, can be a means of improving our knowledge about teaching and learning in a cross-cultural environment. In the future, the size and scope of the project will need to match the resources available. One strategy to accomplish this could be to infuse the "project" into the already existing curriculum. The project must be voluntary and the expertise of the teachers should be matched to the project.

The community needs to be more fully involved in the development of projects. Ways for paying elders for their work in the school, including financial renumeration, must be worked out prior to implementation. Certainly, additional documentation on school-community relations must be obtained to more fully understand how the school can become a more positive part of the community.

VI. E. Integrating Environmental Values In Science and Technology Education

James D. Lubbers, SUNY at Fredonia.

It is becoming difficult to read anything about science education these days without finding the word "technology" attached, often in the context of Science-Technology-Society (STS)-type courses (Bybee, Carlson and McCormack, 1984). Beside the fact that science education is often criticized for not providing scientific (and now, "technological") literacy, once again regaining our nation's "technological superiority" seems to be a motivating force in this development. In light of the role of technology in society, people are more often affected--both positively and negatively--by "technology" rather than by pure "science," so the need for such a change is clearly necessary. Also, since science and technology are inextricably intertwined, the need for understanding the science behind the technology will be ever-present. Therefore, the marriage of science education with technology education represents a new and expanded version of the science education movement of the post-Sputnik era.

As curriculum development follows the trends, change will seem slow, but there is considerable activity already. Currently, officials of several state education departments are reorganizing and updating their school science curricula (Bindel, 1985). At the college level, several colleges and universities across the nation are involved in plans to incorporate science and technology concerns into the undergraduate core curriculum (Brinkerhoff, 1985; Chen & Novik, 1984; Cutcliff, 1984; Koerner, 1985; Menefee, 1984; Petrosky, 1984). In addition, many institutions of higher learning now offer interdisciplinary programs in STS (Roy and Lerner, 1983).

This trend is important for environmental educators for several reasons. First and foremost is the fact that technology, while inherently neutral, clearly has both positive and negative impacts on the quality of life. Any thorough and unbiased form of "technological literacy" should increase awareness of the environmental constraints on technological advance and development and also provide a greater sensitivity to the costs and risks of overuse and misuse of technology. Unfortunately, the "technology" component in "science and technology" education is often defined in a limited sense as "functional" or "machine" (e.g., computer) literacy, thus ignoring the broader meaning, and as such becomes a mere extension of the traditional motivation behind science education. What we as environmental educators need to do is to make sure the balance of perspectives is maintained. For example, in making the decision to use an automobile or a computer, one should have an understanding of the costs/risks involved, as well as the benefits, rather than indiscriminantly using the technology just because it's there and he knows how to use it. If technological literacy is not steered in this direction, we will see a new environmental movement even more urgent and of greater proportions than the first.

STS education is also important to environmental educators because it represents the institutionalization of environmental concerns and the incorporation of a broader and more critical examination of the impacts of science and technology in society. STS is an interdisciplinary blend of the many attempts to help improve the human condition. Many of the objectives presented in STS curricula overlap with the objectives of environmental education (EE). Topics such as population, resource use, and environmental degradation are intimately related to STS, as well as to EE. Although it may seem that the origins of STS education and EE are different, operationally they are not. We should avoid any further fragmentation of efforts and realize that many of the original goals of EE have been met. We must not overlook or under-acknowledge the extent to which environmental issues have become ingrained in society. To gain the recognition EE deserves, perhaps the letter "E" should be included in "STS" to produce "SETS" as a more appropriate designation (Figure 1). The interactions between the environment and science, technology, and society are just as fundamentally important as any of the interactions, and need to be recognized as such. In fact, Zollar (1984) even suggests that "Environment and

Technology Education (ETE) should become an integral component of future science teaching" (p. 393). It is difficult to know just how hard the issue is being or can be pressed into fruition. Efforts are underway from several fronts (Bybee, et al., 1984), but all the while, the multidisciplinary nature of environmental issues and their relationship to science and technology continue to feed the confusion (Caldwell, 1983).

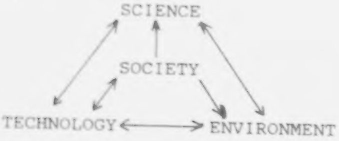

Figure 1: Interactions for "SETS" Education.

By implication, STS education presents a unique opportunity for continuing and expanding the goals of EE established in the 70s. In particular, the "society" dimension implies that S&T must "serve" the people, and as a human endeavor, S&T can be and must be controlled by the people. Mistakes resulting from our misuse of, dominance over, and attempts to control the natural environment, have proven to be an effective reminder of the need to make careful decisions regarding the use of technology. There is indeed room for increased awareness of the interdependence between humans and nature. The synthesis of STS education and EE could provide a more balanced understanding of human nature and the responsibilities we have to future generations and to the long-term survival of Homo sapiens.

The underlying goal of SETS education is to develop the best possible curriculum to provide the type of literacy necessary to avoid "life-threatening" situations, whether on an individual or a global scale. And nothing is more life-threatening than the gradual or immediate destruction of the environment, be it personal, human, or natural. What is needed at all levels of education is to develop values which nurture the ideal of a harmonious coexistence of humans with other humans, and with the natural world--humans being a part of nature rather than apart from it. For example, a useful analogy to help students is to have them view themselves as not significantly different from organisms in a natural ecosystem. Like animals, we do have a sense (however psychotic) of what will keep us alive and what will kill us. Because of our specializations and unique ability to modify the environment, we tend to separate ourselves from nature, yet we are still subject to ecological principles and natural limits to growth. The major difference from animals is that we think we can overcome these limitations and are able to think about it in a collective and future-oriented sense. Such an attitude could be described as "speciesist," which suggests an arrogance toward and dominance over nature. In other words, "speciesism" needs to be balanced with an opposite view that stresses our dependence on nature. If students understand their relationship to nature, they would then be better prepared to understand the connections between a technological society and the natural environment.

Knowing the range of values associated with both the natural environment and the human environment can help students understand their "niche" in society. The relationship can be described by a "survival matrix" of two continuum, one representing extreme views toward nature and the other representing the extreme views toward technology (Figure 2). Autonomous technology is characterized by technological determinism which implies a lack of understanding and control over technology. Humane technology can be visualized as a "workforce of gentle giants" under our control and maintained by us. The extreme views toward nature are suggested here by Subdued and "Mother" representing our arrogance as a species, and our dependence on natural environment, respectively.

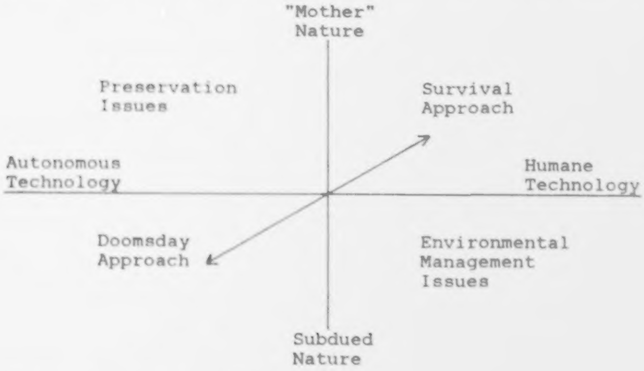

Figure 2: Survival Matrix.

The quadrants defined by the extreme attitudes toward nature and technology can help students organize the wide range of perspectives about the role of humans on the earth. As an organizer for survival, an understanding of each dimension of the matrix can provide a framework for decision-making which is adaptable for all kinds of dilemmas, personal or global, immediate or long-term.

The trend toward "technological literacy" is good, but we can make it better by incorporating environmental values into the curriculum wherever appropriate. A basic ecological principle is "everything is connected to everything else." As with ecology or society, there are similar connections in education. Helping students at all levels to understand the interdependence between humans and environment is imperative for survival.

REFERENCES

Bindel, Jr., H.J. NSTA Supplement of Science Education Suppliers. National Science Teachers Association. 1985.

Brinkerhoff, R.F. A New Technique for Teaching Societal Issues. Journal of College Science Teaching, 14(6):475-479, May, 1985.

Bybee, R.W., J. Carlson, & A.J. McCormack, (eds.). Redesigning Science and Technology Education. (Yearbook of the National Science Teachers Association) 1984.

Caldwell, L.K. Environmental Studies: Discipline or Metadiscipline? The Environmental Professional, 5:247-259, 1983.

Chen, D. and R. Novik. Scientific and Technological Education in an Information Society. Science Education, 68(4):421-426, 1984.

Cutcliffe, S.H. (ed.). Science, Technology and the Liberal Arts: A Conference Summary. Science, Technology & Society (Curriculum Newsletter of the Lehigh University STS Program & Technology Studies Resource Center). No. 41, 1-3, April, 1984.

Koerner, J.D. The New Liberal Arts Program. NLA News, 1:4, 1-5, April, 1985. (Published by the Department of Technology and Society at SUNY Stony Brook).

Menefee, R. Science, Technology, and General Education. Journal of College Science Teaching, 13(6):398, May, 1984.

Petrosky, H. Technology is an Essential Component of Today´s Liberal Arts Education. *The Chronicle of Higher Education*, 25(12):88, Nov. 14, 1984.

Roy, R. and J. Lerner. The Status of STS Activities at U.S. Universities. *Bulletin of Science, Technology & Society*, 3(5):417-432, 1983.

Zollar, U. Science Teaching and Learning in Future Higher Education: Future-Oriented Projects of Interdisciplinary Science Curriculum Development (The Israeli Connection). -Bulletin of Science, Technology & Society´, 4(5):393-401, 1984.

VI. F. An Analysis of Correlates and Predictors of Responsible Environmental Behavior

Thomas J. Marcinkowski, Harold R. Hungerford, and Audrey N. Tomera, Southern Illinois University, Carbondale.

In EE, there is widespread recognition that "Responsible Environmental Behavior" (REB) is a telling characteristic of "Environmentally Literate Citizens." Despite this, research on REB has been scattered and inconclusive. Important studies by Hines (1984) and Sia (1984) have largely reversed this situation. Using their findings, this study seeks to extend knowledge of and instrumentation for measuring correlates and predictors of REB.

VI. G. EE Practitioners and State Organizations

Martha C. Monroe, School of Natural Resources, University of Michigan.

Most people join professional organizations because they value the group´s stated purpose and wish to contribute to the attainment of those goals. Other strong incentives for joining are to meet people of like minds, to receive the benefits of membership, and to feel a part of a worthwhile effort. To continue to attract new members, organizations should be aware of their members´ needs (Wilson, 1973).

Once people join an organization and participate in the activities, they remain members if they receive any of the above incentives. A strong sense of pride may be developed in their organization from past experience and future plans. Organizations that address causes or movements may change over time as their major issue waxes and wanes in the public eye. For the future health of an organization, it is necessary to understand the membership's commitment and interest, and the current trends.

In Michigan, two state professional organizations that grew from national movements are contemplating a merger. Over the years each developed a following that feels committed to their organization's purpose. The groups, the Michigan Environmental Education Association (MEEA) and the Michigan Outdoor Education Association (MDEA), have overlapping goals and engage in similar activities. The basic philosophical foundations of the groups, however, are slightly different. For years the Directors of both Boards skirted the issue of merger with little more than their personal feelings to guide policy. In February, 1985, both Boards authorized a survey to better understand their memberships. This survey is the first attempt to record the voice of the membership on the question of aligning the activities and the structures of MDEA and MEEA more closely together.

Michigan's Beginnings

In many ways, Michigan's environmental awareness reflects the mood of the nation. Rich in natural resources, urban growth, and environmental controversies, it mirrored the national development of outdoor, conservation, and environmental education. Michigan also contributed leaders to these national movements: Julian Smith (MSU) and William B. Stapp (UM) played major roles in the development of outdoor and environmental education, respectively.

In 1967, a group of Department of Natural Resources employees and educators formed the Michigan Conservation Education Association to promote education for the conservation and wise use of natural resources. Several years later the group began to address the human connection to environmental issues and changed the name to the Michigan Environmental Education Association.

Julian Smith began hosting annual outdoor education conferences in 1953, in cooperation with the State Department of Education's physical education program. The focus was on outdoor recreation and school camping. Later, with the involvement of teachers, outdoor education grew to include a variety of skills. After his death, the Michigan Outdoor Education Association was formed in 1978 to continue to spread his message to teachers, camp directors, and others.

Both organizations now include among their members teachers, school administrators, nature center and camp directors, college professors, and resource managers. Both groups publish a newsletter, and both hold annual conferences. In order to attract a large attendance, both conferences tend to offer sessions that span the gamut from nature study, outdoor games, and environmental songs to values education, problem-solving, and controversial issues. Despite the many documented similarities and differences, the real question for organizational planning concerns the members´ perceptions of the goals and activities of each group.

Survey Goals

In 1984, the MEEA and MOEA Presidents formed parallel committees to discuss ways of coordinating activities. At a Winter Retreat in February, 1985, the joint committee expressed a need for a survey of both memberships. It felt that such a survey should answer these questions:

1. Who are the members, by age and profession?
2. What do they enjoy in the organization and what new activities would they like included?
3. Which activities can be merged; which should remain separate?
4. Which organizational structure do they prefer, one merged, or two separate groups?

Methodology

This survey was modeled after the Total Design Method of survey design (Dillman, 1978), with a few changes. He recommends up to five reminder and repeat mailings (we only did one), and keeps track of respondents by numbering each form. Our survey was anonymous. He samples a large population to analyze trends; we surveyed the entire population to get a sense, as true as possible, of their feelings on this important issue. His surveys are serious and business-like; ours was printed on colored paper and carried a lighter tone, more typical of the organizations. He allows 5-7 weeks for people to respond, and we limited our members to 2 weeks to meet the constraints of computer availability.

The joint committee of MOEA and MEEA Board members offered extremely valuable feedback and support through the entire process. After initially approving the proposed budget, they offered advice on the wording of the questions.

The first draft of questions was pre-tested with out-of-state environmental educators and the committee. The surveys were sent with return postage to improve the response rate. One week after the surveys were mailed, a Thank you/Reminder postcard was sent to the full population. The surveys were sent in mid-March to precede the flurry of spring activity that strikes OE/EE people in April.

The surveys were due by March 28, but dribbled in steadily until April 15. The data were analyzed with a straight frequency and twoway tables.

Surveys Sent, Surveys Received

The original mailing lists from both organizations totaled over 850 members. After eliminating the invalid and duplicate memberships, the "accurate" count was 618. Of these people, 60 were members of both organizations. I mailed surveys to these 558 different members. The U.S. Postal Service returned 8 unopened surveys; the population of eligible respondents was 550.

I received 306 surveys by April 15, representing 56 percent response rate. This healthy response represents a strong interest in the organizations, and should accurately reflect the diversity and preference of the memberships.

Results

This survey was undertaken to provide information that will be used for long-range planning for MOEA and MEEA. Almost everyone in each organization (93 percent) feels that MOEA and MEEA should at least coordinate activities and share resources. Nearly two-thirds of the members (60 percent) prefer that the two groups merge into one. Given financial constraints and the limited resources of the membership, this recommendation makes good sense. Only 7 percent prefer that the organizations remain independent.

Despite this apparent compatibility, the survey indicates that the organizations may in fact serve different purposes, or offer their members different incentives. Members of MOEA rate these reasons for being a member: "enjoy meeting people" and "gain leadership skills," more highly than MEEA members. Perhaps MOEA offers an environment more conducive to socializing than MEEA.

Many people commented that they enjoyed their organization as it exists, and although they wouldn't mind merging, do not want to lose the benefits they receive. MEEA, it was feared, would lose its political outlook and influence.

It would seem that the organizations have the support of their members to take immediate steps to coordinate activities. The joint Winter Retreat received a positive vote; perhaps a joint newsletter could be published several times a year. A small percentage of the respondents mentioned they would like to learn more about the other group--a joint newsletter may meet this need.

If MOEA and MEEA do merge, the resulting organization should make every attempt to preserve the integrity of the original organizations. Each has slightly different methods of reaching the same goal.

The similarities and differences in the membership profiles are also interesting. An equal percentage of K-6 teachers make up the MEEA and MOEA memberships, but MEEA has more 7-12 teachers (the majority teach science). Many of the members who work in camps and nature centers join organizations. The sex ratio also varies, with 60 percent of MOEA being male, and 60 percent of MEEA, female.

The age ranges of the two groups are virtually identical, with 35 percent from 31-40 years old, 44 percent of the members are older than 40, and 21 percent are younger than 31.

An interesting difference surfaced when awareness of the other organization was compared to the degree to which the respondent thought the organizations were similar. In MOEA, the more people know about MEEA, the more similar they thought the groups were ($n=117$, $p<.005$). This relationship was not significant for MEEA members. Evidently, awareness can lead to a belief that the organizations are not similar, and a lack of awareness may not prevent people from thinking they are similar. Nevertheless, a large majority of MEEA members prefer that the groups merge. Perhaps, than, despite the differences, some members believe these organizations should cooperate and coordinate activities.

Addendum

In July, 1985, the joint committee of MEEA and MOEA drafted a proposal to move toward a merger of the organizations. In September both Boards approved the plan. If the members vote to merge, we will have one organization in Michigan in 1987.

REFERENCES

Dillman, Don A. Mail and Telephone Surveys: The Total Design Method. New York: John Wiley and Sons, 1978.

Smith, Julian. Outdoor Education in Michigan Schools. Lansing, MI: State Department of Education, 1970.

Unesco. Environmental Education in the Light of the Tbilisi Conference. Paris: Unesco, 1980.

Wilson, James O. Political Organizations. Basic Books, 1973.

VI. H. A Comparison of Energy Knowledge and Attitudes of Maine and New Brunswick Ninth Graders

J. Thomas Morrisey, University of New Brunswick, Fredericton; Lloyd H. Barrow, University of Maine, Orono.

The purpose of the study was to determine if there is any relationship between energy knowledge and attitudes of ninth graders by gender and by geographical location. Males had a significantly greater knowledge score than females for both locations. Maine students had a more positive attitude toward energy. Findings included that energy literacy is at an inferior level.

VI. I. The Relationship Between Environmental Behaviors and Personality Factors in Church Members and Environmentalists

Chris Newhouse, Spring Arbor College.

The primary goal of environmental education is to produce persons who are competent and willing to take action on environmental issues. Some persons are competent and willing to take action on environmental issues. Some persons are competent and do take action; others aren't or don't. In the case of environmental activists, what explains their action? Among those who are not active, what explains their non-action? It is this author's belief that an understanding of motivation and personality is important in answering these questions.

Dunlap, Grieneeks, and Rokeach (1983) surveyed users of a recycling center to find a values profile of environmental activists. In general, they reported, environmental activists have higher-level (in the Maslowian sense) values than the general population. This report looks more deeply at the connection between environmental action and personality factors.

This study surveyed two groups on factors including the following: position on the Maslow personality hierarchy, ranking of Rokeach's terminal values, type and amount of environmental action, and perceived amount of commitment necessary to take environmental action. The groups were first, members of environmental groups (individuals from the Sierra Club, the West Michigan Environmental Action Council, and the Audubon Society), and second, members of Free Methodist Churches. The study populations were chosen to represent a group traditionally very active in environmental events, and a group traditionally less active in those events (Arbuthnot, 1977).

The personality tests were chosen to complement one another. Maslow's needs hierarchy is seen to be a standard representation of some central core attributes of personality. The test for Maslow level was Michael Beer's Preference Inventory (1966). Rokeach's terminal values (Halgren tests, 1972) were chosen to represent elements of personality which are more peripheral, but which are possibly more direct antecedents of action.

Although several environmental action surveys currently exist, this author designed yet another instrument to attempt to understand the amount of motivation behind the action. It was conceptually based on the model of Peyton, reported in Hungerford and Peyton (1976), and included examples of actions in each category. In addition to the 17 actions making up the test, there were subtypes for each action, designed to assess degree of commitment to each action. An example of one such action with subtypes follows.

Within the past year, how often have you

1. Picked up any type of litter -

a. at home
__ not at all
__ seldom
__ occasionally
__ frequently

b. in your neighborhood
__ not at all
__ seldom
__ occasionally
__ frequently

c. in public areas
(parks, etc.)
__ not at all
__ seldom
__ occasionally
__ frequently

d. in commercial areas
(parking lots, shopping centers)
__ not at all
__ seldom
__ occasionally
__ frequently

While a person might pick up litter in one situation for several reasons (financial, peer pressure etc.), it is expected that litter pickup in several situations is a better indicator of genuine environmental concern being the motivating force.

One more section was added to further assess the respondent's level of commitment to an environmental action (his/her motivation to take such an action). This section asked the respondent to quantify how much environmental concern or commitment it would take to do each of the 17 actions.

The specific research questions are as follows:

Research Question 1: Is there a relationship between Maslow level and environmental action (level and type)?

Research Question 2: Are there relationships between an individual's Maslow level and priorities on Rokeach's terminal values survey?

Research Question 3: Is there a relationship between the priority of specific elements of Rokeach's terminal values survey and environmental activism (level and type)?

A synopsis of the results shows that Maslow level (as measured with Beer's Preference Inventory) was found to have no significant relationship with environmental action, or with dominant Rokeach terminal values.

Rokeach terminal values were significantly related to level of environmental action. Rokeach terminal values were also related to type of environmental action.

Values profiles were compared for different groups. Although the profiles were formed by different means, this writer feels the comparison is still important. Figure 1 corroborates Dunlap, Grieneeks, and Rokeach with regard to recyclers, but shows major differences between recyclers and members of environmental groups. In fact, the three values ranked most highly by all environmentalists combined in the current study (peace, health, and family security) are all described as "lower order" values by DG&R. Their use of recyclers to generalize to all environmental activists is strongly questioned. This researcher recommends that environmental activists not be considered to be a homogeneous group.

When values-derived groups were examined for action levels, it was seen that those in the group ranking "self-respect" as their first priority Rokeach terminal value show the highest levels of environmentally influenced voting actions. It was also seen that those in the group ranking "sense of accomplishment" highest in priority showed highest levels of environmental action in those actions involving money--purchasing, boycotting, and donations. As is the case in advertising with its increasingly sophisticated marketing research, environmental educators should specify which actions or which groups are targeted, then use existing knowledge to best elicit the desired behaviors.

Figure 1. Values Profiles For Selected Groups

Environmentalists[1]	Church[2]	Recyclers[3]	DGR Recyclers
Peace	Salvation	Self-Respect	Wisdom
Health	Health	Wisdom	Self-Respect
Family Security	Family Security	Sense	Family Security
(Self-Respect 6th)	(Peace 11th)		(Peace 10th)
(Wisdom 7th)			

[1] In order of value most of ten chosen as first priority.

[2] "Salvation" was virtually always chosen first priority; succeeding values arranged by frequency of being chosen as second priority.

[3] Classed by recycling score totals for each values groups.

Comparison of the two study groups showed that there were no significant differences between the church and environmental groups on any of the perceived commitment questions. This allows the inference that since the two different groups did not differ significantly on any of the seventeen items concerning perceived commitment necessary to take action, the groups have the same understanding of the amount of commitment necessary. This implies that they have the same amount of knowledge about the action. If further research supports this inference, it would be recommended that less energy be devoted to teaching non-active groups about the issues and that more energy be devoted to developing action skills and motivating people to take specific actions.

This research allows new understanding of factors involved in environmental action. Church groups show a different orientation to life, as shown by their uniformly high ranking of the "salvation" value. It is no surprise that traditional environmental appeals and curriculum have not affected this group. This researcher recommends messages and communicators with a stronger religious context to involve these groups.

For environmental groups, this research allows more specific targeting of subgroups and specific actions--to make communications and curriculum most effective and to help reach the goal of an environmentally active citizenry.

REFERENCES

Arbuthnot, J. "The Roles of Attitude and Personality Variables in the Prediction of Environmental Behavior and Knowledge." Environment and Behavior, 9(2), 1977.

Beer, M. The Ohio State University Bureau of Business Research, 1966.

Dunlap, R., J. Grieneeks, and M. Rokeach. "Human Values and Pro-Environmental Behavior". AAAS Selected Symposium 75. Westview Press. Boulder, Colorado. 1983.

Hungerford, H. and R. Peyton. Teaching Environmental Education. Portland, ME. J. Weston Walch. 1976.

Rokeach, M. "Terminal Values Survey", copyright, Halgren Tests, San Francisco, CA. 1972.

VI. J. The Development of Volunteer Programs for Nature/Environmental Centers

Miriam Pfeiff and Richard J. Wilke, University of Wisconsin, Stevens Point.

Nature centers and environmental education-related facilities are often understaffed and underbudgeted. One method these centers have used to keep up with the demand for their programs is to organize and promote volunteer programs. The information presented was derived from a literature review and analysis of responses to a questionnaire mailed to nature centers with volunteer programs throughout the country. Recommendations on recruiting, training, motivating, and retraining volunteers were discussed.

VI. K. Correlating Locus of Control and Environmental Activism

Cynthia Sanford, Richard Wilke, and Randall Champeau, University of Wisconsin-Stevens Point.

In an attempt to predict potential environmental action-taking behavior, an instrument entitled the Revised Perceived Environmental Control Measure (RPECM) was developed to investigate the link between locus of control and behaviors related to environmental activism. The RPECM was administered to four college classes. Statistical analysis provided evidence of reliability, content validity, and construct validity. The majority of subjects perceived themselves as having some personal control over environmental concerns. Implications of the result and recommendations are discussed.

VI. L. Encouraging Energy-Conservation: The Role of Satisfaction

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The emphasis on cost-effectiveness and pay-back periods in promoting energy conservation may have left the impression that only money talks. For the most part, studies of motivational factors responsible for conservation behaviors have focused on external rewards or inducements (Geller, Winett and Everett, 1982; Cone and Hayes, 1980). Direct monetary incentives such as rebates, prizes and tax credits have all been used to encourage energy conservation. While such incentives have been found to induce conservation behavior, these behaviors may only endure as long as the financial benefits remain in place (McClelland and Canter, 1981).

There is, however, a larger array of factors that motivate people to conserve energy. Indeed, conservation appeals that limit themselves to economic arguments also may reduce their effectiveness by not making their appeal on as many fronts as possible.

But what type of motivations are there that support conservation behavior? A number of studies have documented that people will often do things that have energy-saving consequences simply because they like doing the activity in itself (e.g., it's fun or challenging), or because of a sense of moral appropriateness (e.g., I just have always done it that way and it would feel wrong to do it any other way) (Simmons, Talbot, and Kaplan, 1984-85; Widmar, DeYoung, and Kaplan, 1984). One study of adults who identified themselves as "energy conservers" documented forty different satisfactions obtained from everyday conserving behaviors (Widmar, DeYoung, Kaplan, 1984). These valued aspects of people's lives may well provide additional approaches to promoting energy conservation.

The Study

The objective of this study was to expand the examination of conservation-related satisfactions to children. In the study, 302 sixth grade students attending a four-day residential environmental education program at the New Jersey School of Conservation completed an "energy questionnaire" during the week before coming to the camp. The 65-item survey included questions concerning their energy conservation behavior and knowledge as well as satisfactions They might gain from a variety of activities. Most of the satisfaction items were drawn from the results of a previous study of adults (Widmar, DeYoung, and Kaplan, 1984).

All items were cluster-analyzed using SSA III (Lingoes, 1972) and ICLUST programs (Kulik, Revelle, and Kulik, 1970). This analysis resulted in six clusters of items that the participants rated in similar ways. The six clusters of satisfactions, along with descriptions of the specific items included in each, are presented in Table 1.

TABLE I

Cluster	Questionnaire Items	Mean Rating
Outside Activity		4.41
	*enjoy being outside in the fresh air	
	*enjoy riding my bike	
	*can save energy by riding my bike	
Nature		4.26
	*enjoy watching people or animals	
	*love being outside in nature	
Willingness to Do		3.36
	*in the future I will do a lot of little things to save energy	
	*I would like to work on ways to save energy at my school	
	*I can help improve the quality of life on earth	
	*one person in particular has taught me a lot about energy	
	*I don't mind when the heat is turned down	
	*in the next year I will make some big changes in how I use energy	
Challenge/Learning		3.25
	*enjoy thinking about ways to save energy	
	*enjoy discovering new ways to save energy	
	*enjoy learning about ways to save energy	
	*enjoy working on challenging mental problems	
	*enjoy showing others how to save energy	
Waste Not		3.99
	*water is a valuable resource that should be wisely used	
	*trees are often cut down to make paper that is just wasted	
	*wasting natural resources is bad	
	*it is better to reuse something than to buy a new one	
True Conserver		3.52
	*don't mind turning off the lights	
	*it is important to save energy	
	*no need to save energy (reversed item)	
	*technology will not solve our energy problems	
	*conservation does not mean living less comfortably	
	*I save energy even if it doesn't save money	
	*does take a lot of energy to leave the lights on	
	*you would not have to pay me to save energy	

Results

The wide range of satisfactions that emerged in the study of adults was reflected here as well. Satisfactions dealing with the enjoyment of everyday types of activities as well as a sense of moral appropriateness are found.

Enjoyment of Everyday Activities. Many of the satisfactions reflected the enjoyment of activities that used only small amounts of energy. While it is doubtful that these behaviors were selected by the children because they might save energy, what is important is that such behaviors are already present providing good examples of energy savings that can be fun and a complimentary part of everyday life, not something special. Saving energy should not be thought of as something that is only a sacrifice, something you have to have to do. Rather the ways in which energy conservation can be integrated into existing activities should be emphasized to help make energy conservation seem a "natural" part of everyday life.

Childhood is an active time when a large part of any "typical" day may be expected to take place in the out-of-doors. Perhaps not surprisingly, the enjoyment of being in the out-of-doors and participating in activities in a natural setting were highly endorsed by the students. Satisfactions gained from Outside Activity such as being "outside in the fresh air" and "riding their bikes" were given the highest ratings (mean = 4.41). The important role that the out-of-doors plays in these children's lives was also shown by the high rating given to Nature (mean = 4.26). This cluster, which included enjoyment of "watching people or animals" and being "outside in nature", reflects satisfactions gained from relatively low energy consuming activities. The next two clusters characterize an interest in solving problems. Willingness to Do (mean = 3.36) voices a sense of personal efficacy, a willingness to commit time and energy to solving environmental problems and importantly, a belief that they as individuals can make a difference. Challenge/Learning, while displaying a slightly lower mean rating (3.25), expresses satisfactions gained from thinking, learning, and discovering about ways to save energy. The enjoyment derived from mental tinkering may be especially interesting to educators who deal within a formal learning setting.

A Sense of Resource Responsibility. A sense of "appropriate behavior" was also evident in the students' responses. They expressed a strong sense of responsibility toward resource conservation. Perhaps the most encouraging of all the results was the presence of an environmental ethic in the Waste Not cluster (mean = 3.99). That cluster included a recognition that "water is a valuable resource" and that "wasting natural resources is bad", also included a sense of the importance of frugality. The students embraced the idea that it was better to reuse something than to buy a new one, as well as expressing a dislike of throwing things away.

Additionally, the desire to act responsibly toward resources was evident in the relatively high ratings given to the True Conserver cluster (mean = 3.52). Again, the students expressed a belief that it is important to save energy, while stating that monetary rewards were not necessary in order for them to conserve. Another item within the True Conserver cluster, the doubt that technology will solve our energy problems, is very encouraging given recent results reported by Borden (1984/1985) showing a negative correlation between faith in technology and environmentally responsible activity. If the students maintain their True Conserver perspective, the likelihood of their developing positive environmental behavior patterns seems to be increased.

Discussion and Conclusions

Just as with their adult counterparts, the students expressed a wide variety of satisfactions and interests. They enjoy being in the out-of-doors and in nature. They are concerned with the waste of resources. They are committed to doing things that will help, and feel that their efforts are meaningful. Although money did not emerge as an independent cluster and the students did not feel it would be necessary to pay them to conserve, saving money in and of itself was important to the students. Individual items dealing with money, "saving money is very important" (mean = 4.37) and "it is fun to save money" (mean = 3.93) were highly endorsed.

By looking closely at these satisfactions one is able to map strategies for giving students the opportunity to participate in personally satisfying behaviors (e.g. being in the out-of-doors), while also introducing them to conserving behaviors (e.g. planting an organic garden). The general interest of students in nature or in finding challenges will not necessarily lead to low consumption behaviors. The critical effort will involve finding ways of matching life satisfactions with positive behavior patterns. Thus, building a lifestyle which incorporates both satisfying and conserving behaviors.

REFERENCES

Borden, R. "Psychology and Ecology: Beliefs in Technology and the Diffusion of Ecological Responsibility." Journal of Environmental Education. Vol. 16 (2), 1984-1985.

Cone, J. and S. Hayes. Environmental Problem/Behavioral Solutions. Monterey, CA: Brooks/Cole.

Geller, E.S.; R.A. Winett; and P.B. Everett. Preserving the Environment: New Strategies for Behavioral Change. New York: Pergamon Press.

Kulik, J.A.; W.R. Revelle; and C.L. Kulik. Scale Construction by Hierarchical Cluster Analysis. Ann Arbor: University of Michigan Computing Center, 1970.

Lingoes, J.C. "A General Survey of the Guttman-Lingoes Non-metric Program Series." In Multidimensional Scaling Volume 1. In R.N. Shepard; A.K. Romney and S.B. Nerlove (eds.) New York: Seminar, 1972.

McClelland, L. and R.J. Canter. "Psychological Research on Energy Conservation: Context, Approaches, Methods." in A. Baum and J.E. Singer (eds.) Advances in Environmental Psychology: Volume 3 - Energy Conservation: Psychological Perspectives. Hillsdale, NJ: Lawrence Erlbaum Associates.

Simmons, D.A.; J.F. Talbot; and R. Kaplan. "Energy in Daily Activities: Muddling Toward Conservation." Journal of Environmental Systems. Vol. 14, 1984-1985.

Widmar, R.; R. DeYoung; and S. Kaplan. "Conservation Behavior and the Structure of Satisfactions." Unpublished manuscript. School of Natural Resources, The University of Michigan, 1984.

VI. M. Student Attitudinal Changes on Environmental/Energy Issues, 1971 vs 1981*

John C. Thompson, Jr. and Edgar L. Gasteiger.

Introduction

Numerous factors played upon the public conscience during the '60s to make individuals acutely aware of environmental, energy and resource issues (1,2,3,4,5,6). Academia responded well to these newly recognized problems, and campuses experienced a rejuvenation of fields such as natural resources, ecology, toxicology, and environmental quality. University students moved quickly to the forefront of environmental concerns, recognizing that the issues were real and that personal sacrifices undoubtedly would have to be made (7,8,9,10). At Cornell University, a survey was developed to measure the environmental attitudes of Cornell students during this period of intense environmental concern. It served to examine the changes in attitudes and possible reactions to environmental/energy events that took place during the 1971-1981 period. The studies focused on the student's self-rating of his or her willingness to give up items in major categories that have an impact on life style, use of resources and contamination of the environment.

Design of Study

A questionnaire provided a broad examination of energy and resource issues as they related to existing and expected living conditions. It consisted of four sections:

1. Response to a general statement on environmental/energy issues
2. Quantified responses about the willingness to give up specific items (35 items in five major categories)
3. Assessment of various control measures
4. Respondent's profile (personal, family and academic factors).

Attitudinal responses were recorded as numerical values (e.g. least willing to give up an item = 1, most willing = 5, and intermediate feelings = 2, 3, and 4.

Response Rates and Return Patterns

In both surveys, a one-third proportionate sample of students enrolled in each of the undergraduate colleges at Cornell University was selected from the registrar's alphabetized listing. Questionnaires were mailed to each student selected. The response rate averaged 54.2 percent for 1971 (1985 replies from 3414 student sample), and 35.2 percent for 1981 (1363 replies from 3867 student sample). Despite the lower overall response rate in 1981, there were no significant differences in the distribution pattern of responses among the four undergraduate classes. However, in 1971, 32.7 percent of the respondents were female whereas by 1981 this representation had increased to 43.4 percent. This change was in agreement with the increased number of female students in attendance in 1981.

Analysis

Inter-Survey Data Comparisons. The initial question presented on the survey questionnaire was concerned with students' reaction to the statement about our material and energy resources (numerical responses of 1 = strongly disagree to 5 = strongly agree). Although the mean numerical values were quite similar for the 1971 and 1981 survey (4.14 versus 4.00), those who checked the category "strongly agree" were significantly fewer in 1981 than in 1971 (37.3 percent versus 45.7 percent). This shift was consistent with the patterns that developed for many other 1981 responses. It was especially evident in terms of the political leanings that were designated by the students. In 1981 the average political rating by the students was 3.87 versus 3.28 for 1971 respondents (on a scale where 1 = very radical and 7 = very conservative). This was a significant shift to conservatism (0.01 level) over the ten-year span and is an important component of the attitudinal responses for many of the items in the survey. Another important shift was shown by the proportion of students who changed their outlook about the desired purchasing power of their family versus their parents' family. In 1971, 58.4 percent of the students indicated that they desired their own families to have equal or greater income than their parents' families, whereas by 1981 the proportion who had such feelings had increased to 73.7 percent.

Paired "t" tests were used to examine the inter-survey differences in attitudes toward specific items over ten-year span. Results for these analyses indicated that significant differences were observed at the 0.05 level for 25 of the 35 items tested. The differences were most evident in the transportation, household, personal and recreational item categories. In 19 of the 25 items which showed significant differences, the mean values for the 1981 survey were lower than the 1971 survey means. This reflected a general tendency toward less willingness to give up items for the 1981 respondents. In terms of individual item ranking, the least willing "give ups" for both surveys were soap, home oven, milk, telephone, and the automobile. Conversely, the items considered most easily given up were supersonic jet travel, home garbage disposal, country club, canned soft drinks, and the motorcycle.

Intra-Survey Data Comparisons. Analysis of variance techniques were used for the data within each survey period. Variables such as political leaning, income, academic factors (class, college or special courses), gender and geographic background (rural, urban, suburban, home state) were tested against the set of attitudes in each grouping to examine the importance of these variables in the attitudinal choice patterns of each survey. A brief summary of these analyses are presented here:

Political. The liberal contingent (number 1 and 2 responses) declined from 26.7 to 14.3 percent, whereas the middle group (number 3, 4, and 5 responses) increased from 69.1 to 75.6 percent and the conservative group (number 6 and 7 responses) rose from 3.7 to 10.0 percent. Political ratings correlated well with attitudinal changes in 33 out of the 35 items in 1971 and 28 out of 35 items in 1981. Students considering themselves as more liberal were most willing to give up items and conversely so for conservatives.

Income. The family income data from both surveys were combined into three groups that were considered representative of students attending Cornell:

(percentage of responses per group)

	1971	1981*
Low Income	up to $9,000 (19.7)	Up to $20,000 (22.4)
Middle Income	$9,000 to $35,000 (70.1)	$20,000 to $78,000 (70.2)
High Income	$35,000 and over (10.2)	$78,000 and over (7.4)

*Adjusted by Consumer Price Index

When income levels were tested against the willingness to give up various items, there were 16 of 35 items in each survey that showed a significant influence of income on the decision-making process. Ten of these items were common to both surveys: clothes dryer, home air conditioner, telephone, hi-fi, air travel, supersonic jet, long distance buses, current fashion, skiing and live musical performances. The household and transportation categories contained the most items for which the responses were associated with income.

In both surveys, respondents from the high income group had lower mean attitudinal values than the middle and low income group (25 of 35 items lower in 1981 and 23 of 35 lower in 1971). Thus, they revealed their greater reluctance to sacrifice.

Academic Status. Very few attitudinal differences were observed in either survey which were related to the year of study by students (Freshmen, Sophomore, Junior or Senior). Only six items in 1971 and three items in 1981 were found to be significantly influenced by the year of study (0.05 level). In direct contrast, the influence of the college of enrollment at Cornell was very important with 28 items of 35 being significantly influenced (0.05 level) in 1971 and 23 of 35 significantly influenced in 1981. The differences followed a rather traditional pattern where students from the arts and sciences areas were definitely more liberal and willing to give up items than were those from engineering, agriculture/life sciences, and human ecology students. Special biology and society courses were not highly significant factors in attitudinal choice patterns (nine and twelve items significantly influenced in 1971 and 1981 respectively at the 0.05 level).

Gender. When gender was used as an independent variable, there were sixteen items in 1971 and eighteen items in 1981 that showed significant differences (0.05 level). The differences were found primarily in the food-stuffs, personal items and recreation categories.

Geographic Background. In both surveys, respondents from rural areas were most willing to give up items whereas urban respondents were least willing and suburban respondents were in the middle of the scale. Significant differences in the rural-urban-suburban classification were observed for 16 items in 1981 and 12 in 1971. Most of the differences were found in the transportation and recreational categories.

Control Measures. Respondents to both surveys favored Federal Laws as the way to limit energy and material consumption.

Discussion/Summary

Significant differences were observed in the attitudinal responses of Cornell students toward material and energy resource questions for surveys taken in 1971 and 1981. Student respondents were most reluctant to give up items in the household category. Items in the transportation, food-stuffs, personal and recreational categories followed in decreasing order of importance. The differences in response were primarily associated with political leaning, income, gender and geographic background, with education being only a minor influence. The changes over the time span revealed a reduced willingness to give up many items despite the perceived material and energy resource limitations. Thus, the trend seemed to be toward a more materialistic lifestyle which reflected less consideration for environmental/energy oriented issues and concerns.

REFERENCES

1. The Gallup Opinion Index Reports, 1960-1970.

2. Louis Harris and Associates Polls, 1960-1970.

3. National Wildlife Federation, Environmental Quality Index, 1969.

4. Towler, J. and J.E. Swan. What Do People Really Know About Pollution? *The Journal of Environmental Education*, *4(1)*:54, Fall, 1972.

5. Rickson, R.E. Self-Interest and Pollution Control. *The Journal of Environmental Education*, *4(1)*:43-48, Fall, 1972

6. Environmental Task Force. National Environment Survey, 1981, 1982.

7. Cohen, M. Environmental Information Versus Environmental Attitudes. The Journal of Environmental Education, 5(2):5-8, 1973.

8. Gifford, R., R. Hay and K. Boros. Individual Differences in Environmental Attitudes. The Journal of Environmental Education, 14(2):19-23, 1982.

9. Van Liere, K.D. and R.E. Dunlap. The Social Bases of Environmental Concern: A Review of Hypotheses, Explanations and Empirical Evidence. Public Opinion Quarterly, 44(2):181-197, 1980.

10. Anthony, R. Trends in Public Opinion on the Environment. The Journal of Environmental Education, 5(2):5-8, 1982.

11. Thompson, J.C., Jr. and E.L. Gasteiger. Environmental Attitude Survey of University Students, 1971 vs 1981. ERIC ED 257 648.

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VI. N. Attitudes of Canadian Students and Teachers Toward the Marine Environment and Marine Education

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> It is time that we learned to think about the present as a dynamically changing situation. If we wish to ameliorate the conditions of our life, we have to think far ahead in order to understand where we are going and to define whether we like our destination or not. If we do not like it, we must decide how we can take a different road at sometime in the future which, when we act, will be the present. (Doxiadis, 1967).

Consider the destiny of the oceans of this planet. The development of the offshore oil and gas industry, increased trade and shipping, the fisheries, coastal zone development, and many other human-related activities either in or on the ocean represent an accelerated pressure on its natural resources. It is clear that effective resource management policy is dependent upon widespread public interest and understanding (Department of Fisheries and Oceans, 1983; Task

Force on Northern Conservation, 1984; Filion, et al., 1983). But do we at present have such an informed, educated public in Canada?

Canada is a maritime nation with ten of its provinces and territories bordering on one of three surrounding oceans. Decisions made about the marine environment and management of human activities in this environment affect the entire population of Canada. But how much do Canadians know about their marine heritage? What are their attitudes toward these resources? How do they learn about oceans? What is the status of marine education in Canada? Is ocean literacy sufficient to equip Canadians to participate in and understand management decisions and thereby effect the oceans' 'destination'?

In January 1985, answers to questions such as these were sought through a survey of approximately 4000 grades 5 and 9 students and 200 teachers from each of the provinces and territories from across Canada. Analysis of these survey results reveals several interesting trends and relationships.

Questionnaire Design

The student questionnaire contained 95 items in four major categories: (1) attitudes toward the ocean, toward different forms of wildlife, and toward various marine issues; (2) orientation or viewpoints in relation to the ocean, its management, and its inhabitants; (3) knowledge about the marine environment and human impact on the oceans; and (4) the student's direct or indirect experience of the ocean. An accompanying questionnaire for teachers solicited their views on marine education in schools.

Results

Students' Knowledge. Overall, knowledge levels were low. Scores varied only slightly from province to province. There was a general trend for a slightly higher score with higher grade level. Lower knowledge levels were obtained by students living close to an ocean (within 100 km) than by students living more than 500 km inland.

Students' Attitudes. Students generally felt very positively about the ocean; 90 percent indicated the sea was "useful", 85 percent "nice", 83 percent "important", 85 percent "interesting". The largest number of students felt the ocean was "a peaceful place" (35 percent) to sit and think and "be close to nature." The next most popular view of the ocean was as a "fun place" (23 percent). Only 2 percent of the students felt it was a "scary place".

Attitudes toward different marine wildlife varied. Marine mammals scored highest in the "love" and "like" categories (over 80 percent for seals and about 60 percent for whales). Terrestrial mammals (wolf and bear) did not score as high as marine mammals.

Most commonly (29 percent) students selected an animal because it was "gentle and harmless", 27 percent of students liked animals for their "spirit and special personality." Only 7.4 percent made a choice of animal on the basis of its edibility or saleability.

In general, students responded with concern over marine issues. Respect for the marine environment was evidenced by 90 percent of the students concern for ocean and lake pollution. Only 55 percent recognized the need for fisheries regulations and 45 percent felt that offshore oil development might have negative impacts on the marine environment. There was a strong tendency for students to evidence a conservation/preservation ethic; 83 percent did not think that humans had the right to control marine species population levels; 70 percent believed that whales should be protected. The majority of students (58 percent) chose, from six options, to develop an area of the coast as a wildlife sanctuary.

Students' Experience. There was a very high percentage of Canadian students that had contact with the marine environment, either directly or indirectly. A total of 75 percent of the students tested claimed to have visited the ocean within the past year, and 60 percent indicated that they had lived at least one year of their life near the sea. However, the fact of being in close proximity to the marine environment did not imply a greater knowledge level in students.

Less than one-quarter of the teachers surveyed indicated that marine education was a "required" area of study, with an equal number indicating they taught it out of "personal interest".

Several factors which did effect a positive change in knowledge scores were (1) reading educational magazines such as National Geographic, Owl, Chickadee, and (2) watching educational television programs such as Wild Kingdom, This Land, and The Nature of Things.

Students frequently reported that their most important source of information about the marine environment was school. However, students with the highest knowledge scores reported that they learned most about oceans from television and direct experiences with the sea. Student knowledge about the marine environment was not significantly related to the presence or absence of marine education in their schools. Use of specific curricula was also not related to attitudes or knowledge scores. However, those students who were taught about the sea in school and were taken on field trips to either the ocean or an aquatic area did show higher knowledge levels.

About 70 percent of the students surveyed felt that it was important to study environmental issues in school; the majority of students chose oceans over any other aspect of the natural environment to learn more about; and of those students choosing an environment-related career, the highest percentage (40 percent) elected to work in the ocean environment.

Teachers' Attitudes Toward Marine Education. Because of their training, interest, and occupation, teachers are in a good position to observe gaps in existing curricula and to have special knowledge of the educational needs of students. For those reasons, their opinions were also requested in this study to determine what is presently being taught in the area of marine education and what more could or needs to be done.

Almost all teachers reported that their students find the ocean interesting (99 percent), and 89 percent perceived the need for more marine education in schools. About 90 percent felt that learning about the marine environment would be of direct relevance to their students. However, materials were scarce. In grade 5, 86 percent of teachers did not use marine curricula materials; in grade 9 the figure was 92 percent.

Less than one-quarter of the teachers surveyed indicated that marine education was a "required" area of study, with an equal number indicating they taught it out of "personal interest".

Finally, teachers were asked for their opinions on how marine education would best be taught (i.e., as a separate course, integrated with other educational disciplines, or as a means for teaching concepts of resource management). The majority of teachers felt marine education should adopt as integrated approach.

Discussion

The results of both the student and teacher surveys clearly confirm the need for more to be done in marine education:

1. Student interests. Students favored learning about the sea over all other environments. Yet only just over half of the students had experienced marine education in school, and only 10 percent of schools had marine education materials in grades 5 and 9. Even where curricula with a marine content is in schools, the actual

amount is low (Graham, et al., 1985). Canadian schools at present are not meeting student interests in marine education and are not capitalizing on this interest to teach basic educational concepts.

2. Availability of curricula. The low percentages of teachers that taught marine education but did not have curriculum materials suggests there are difficulties in teachers knowing about available materials or in obtaining them.

3. Assessment of marine curricula. Findings of this study suggest that there are not significant educational differences in marine curricula or even, for that matter, between teaching with or without curriculum materials. The limitations of this study do not allow the conclusion that all curriculum materials are ineffective. But it does suggest that a required assessment of existing curriculum programs must be done before launching new curriculum projects.

4. Animal interests. Students interest in oceans is strongly connected to their interest in marine wildlife. For grades 5 and 9, materials which focus on this can tap this interest and expand into broader areas. Specific animals with great popularity, such as whales and seals, could be used as 'focal animals' for educational purposes.

5. Orientations. Students with different orientations to the environment report different methods of learning about the sea. This perhaps indicates that a variety of curricula programs is necessary to reach different segments of Canadian children.

6. Television. Students generally learned most about the sea from television. Any marine education program must use this medium as a teaching resource.

7. Field trips. Field trips did make a difference in students' knowledge scores. Curricula should perhaps focus on this aspect of marine education in schools until further studies indicate effectiveness of other teaching methods.

8. Attitudes. Students exhibited very strong views on the preservation of the ocean environment but had little knowledge on which to base them, and they were poorly integrated with their understanding of management options. Marine teaching must attempt to provide the opportunity for students to integrate knowledge with attitudes and an understanding of management. Its goal should be to know and feel about the sea. Such programs will create only a

few biologists, but will succeed in making ordinary citizens aware of the ocean (Hon, 1969).

9. Teachers. Almost all teachers surveyed indicated interests which showed that if supplementary educational materials were available to them, they would use them. Graham, et al. (1985), in a survey of Canadian teachers found that most teachers find materials which they use through contacts with other interested individuals and that a newsletter was their favored means for communication. This argues strongly for the establishment of newsletters and sourcebooks which identify marine education materials which are presently available.

REFERENCES

Doxiadis, C.A. 1967. Life in the Year 2000. National Education Association Journal, 56(8):12-14.

Department of Fisheries and Oceans. 1983. Toward a Fish Habitat Management Policy for the Department of Fisheries and Oceans. Discussion Paper, Fisheries and Oceans, Ottawa.

Filion, F.L., S.W. James, J. Ducharme, W. Pepper, R. Reid, P. Boxall, and D. Teillet. 1983. The Importance of Wildlife to Canadians. Canadian Wildlife Service, Environment Canada, Ottawa.

Graham, R., L. Ewert, and S. Davis. 1985. A Perspective on Pre-University and College Marine and Aquatic Education in Canada. All Wet, Vol. 1, 1985.

Hon, W. 1969. The Regional Marine Science Project of the Cateret County North Carolina Public Schools. Title III Publications, Beaufort, North Carolina, 30 pp.

Task Force on Northern Conservation. 1984. Report of the Task Force on Northern Conservation. Department of Indian Affairs and Northern Development, Ottawa.

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the school personnel who administered the survey, and the students who shared their thoughts with us.

VI. O. Group Beliefs Regarding Different Types of Environmental Action

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The modal salient beliefs regarding six environmental action strategies were obtained from two groups displaying different behavior levels. The modal beliefs and subsequent analysis of similarities and differences were presented.

VI. P. Environmental Decision-Making

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Objectives.

The main objective of this study was to examine the moral reasoning people use when they make environmental decisions. Since there are many different ways to measure moral development, a secondary objective of the study was to compare three different methods of assessing moral reasoning on environmental issues. Another secondary objective was to test the hypothesis that different levels of environmental sophistication would be exhibited according to sex and group (teachers, college students, and adolescents).

Background.

Kohlberg's three levels of moral development preconventional, conventional, and postconventional describe motivations for making moral decisions. Different methods of assessing moral development range from Piaget's clinical interviews to Kohlberg's modified clinical interviews; from Rest's standardized, content-free dilemmas to Iozzi's standardized environmental dilemmas. Using prototypic statements, as Rest and Iozzi did, limits subjects to those statements and does not explore any "new" characteristics of reasoning, as the clinical interviews did. This study included essay questions to search for "new" patterns of reasoning in making environmental decisions. These open-ended questions also allowed us to determine whether or not our findings would tend to confirm Gilligan's theory that women and men have a "different voice" in moral development.

Instruments.

In order to compare different methods of assessing moral reasoning, we used three instruments, two that we developed and one psychometrically validated environmental test. Our first instrument, You and Your Environment (YYE), consisted of twelve multiple-choice questions. The three foils for each question were based on Kohlberg's three levels of moral development preconventional, conventional, postconventional with an underlying temporal, spatial, or congeneral theme. In other words, were subjects concerned about life in the future, in distant areas, or about other life forms? Each question was scored 1 for a preconventional, 2 for a conventional, or 3 for a postconventional response. An example of a question is:

> Recently solar heated homes have become popular in parts of the United States. If you choose to build a solar home, your main reason for building it would be
>
> A. to save money
> B. to keep your immediate environment cleaner
> C. to save fuel for future generations

In order to compare the YYE with another test based on Kohlberg's moral development theory, we used two problems from Iozzi's Environmental Issues Test (EIT). The EIT was based on Kohlberg's six developmental stages and, more specifically, on Rest's Defining Issues Test (DIT). Each problem on the EIT includes a short story stating an environmental dilemma. After subjects have read the story and the list of questions, which are based on Kohlberg's six stages, they are asked to select the four questions they think are most important in reaching a decision. The questions that they choose are than used to determine a principled reasoning score.

Although both of these instruments attempt to measure subjects' thinking about environmental issues, they are restrictive because subjects' responses are limited to those stated on the test. To avoid this problem and to allow free responses, we wrote five essay questions. Each answer was scored in five areas and the score ranged from 1 to 5, i.e., from an egocentric perspective to a world or ecosystem perspective, or from a simple to a complex perspective. The five areas were 1) temporal, 2) spatial, 3) congeneral, 4) number and nature of ramifications, and 5) simple or complex solutions. Interrater reliability correlations for the five areas were, respectively, .90, .74, .85, .89, and .91.

Methods.

The three instruments were group administered to three groups of subjects: science teachers enrolled in a summer workshop (N = 28, age range = 25-60); an undergraduate Survival of Man class (N = 25, age range = 19-65); and adolescents attending an environmental camp (N = 34, age range = 13-18).

Results

Duncan's multiple range tests was used to measure sex and group difference on the test scores. The only statistically significant difference between sexes was on the congeneral aspect of the open-ended questions--females had higher scores than males.

Group scores were statistically different on three components of the open-end test: temporal, spatial, and solution. Statistically significant differences were also found for the total scores on all five of the open-ended questions, and on the YYE. On the temporal component, the science teachers and college students had higher scores than the adolescents; on the spatial component, the adolescents had lower scores than the teachers, but the college students were not statistically different from the other two groups; all of the groups had significantly different scores on the solutions component with the teachers highest and the adolescents lowest. On the total scores for the open-ended questions, the adolescents had lower scores than college students or teachers, but there was no statistically significant difference between college students and teachers. On the YYE, the college students had lower scores than the teachers, but the adolescents' scores were not significantly different from either the teachers or the students. There were statistically significant correlations between the YYE and the EIT, and between the YYE and the open-ended questions.

Conclusions.

The significant correlation between sex and the congeneral aspect of the open-ended questions could be related to Gilligan's theory that women have a "different voice" in moral development. One of her main theses is that women are concerned about relationships and base many of their moral decisions on how other people would be affected by their behavior, whereas men tend to base their moral decisions on principles of justice. On the congeneral aspect of the questions, we scored a response that included concern about children or pets as 3, and concern about all life forms as 5. Many of the female subjects did express concerns about children and pets on the question about spraying for cockroaches.

The low correlation between the YYE and the EIT indicates that the two tests, although based on Kohlberg's theory, are measuring different aspects of the theory. Since we added the temporal, spatial, and congeneral components to Kohlberg's three levels, we incorporated a Piagetian theory of centration--do the subjects take other perspectives besides their own? This difference helps to explain the rather low correlations between the two tests. The lack of a significant correlation between the EIT and the open-ended questions reinforces that basic difference since the scoring on the essays emphasized the temporal, spatial, and congeneral themes.

The correlations between age and the components solution and time indicate that adults tend to view solutions to environmental problems as more complex than do adolescents and are more concerned about the future than younger people.

We will briefly discuss subjects' responses to two of the essay questions which we found interesting. One question involved selecting a menu from groups of foods which represent vastly different environmental costs, and the other involved solving Joe Sixpack's problem with disposing of his beer cans. On the food problem, almost all of the subjects chose menus according to convenience, nutritional value, or personal tastes. Perhaps we were naive, but just the context of the test would seem to predispose subjects to think along environmental lines such as energy required, pollution caused, natural resources consumed. On the beer can problem, many of the subjects simply said that Joe should recycle the cans--a somewhat simplistic solution to an extremely complex problem.

These two questions have given us insights into some problems for the future. Although most students know about trophic levels and could probably describe them on a test, there seems to be little understanding as to how that concept relates to the environment, at least to that part of the environment that includes the production and preparation of the food they eat. It seems that we have taught a concept in isolation, a not unusual finding in educational research.

Another problem that does not bode well for the future was reflected in subjects' glib answer to the beer can problem. As environmental educators we cannot avoid wondering whether recycling has been "oversold" to the exclusion of alternatives such as returning containers or refraining from using products sold only in ecologically unacceptable containers. Researchers who are familiar with both Leopold's statement that in our attempt to make environmental education simple we have made it trite, and data such as these will see the fallacy of oversimplistic slogans in lieu of critical thinking.

Our experiences with the open-ended test lead us to believe that these, and possibly probing, clinical interviews (such as those used and advocated by Piaget) will provide us with more and deeper insights than the more easily administered and far less-expensive short-answer tests so commonly administered.

REFERENCES

1. Gilligan, C. In A Different Voice. Cambridge: Harvard University Press, 1982.
2. Iozzi, L. "The Environmental Issues Test (EIT): A New Assessment Instrument for Environmental Education." In C. Davis and A. Sacks (Eds.) Current Issues in Environmental Education IV. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 200-206, 1978.
3. Kohlberg, L. "Moral Stages and Moralization: The Cognitive Developmental Approach." In T. Lickona (Ed.), Moral Development and Behavior. New York: Holt, Rinehart & Winston, 1976.
4. Piaget, J. The Moral Judgment of the Child. New York: The Free Press, 1965.
5. Rest, J. "New Approaches in the Assessment of Moral Judgment." In T. Lickona (Ed.), Moral Development and Behavior. New York: Holt, Rinehart & Winston, 1976.
6. Yambert, P.A., R.F. Dillon, and C.F. Donow. Psychometric Evaluation of a Test of Environmental Knowledge and Environmental Ethics. Tech. Report No. 1, Departments of Forestry and Educational Psychology, Carbondale, Illinois: Southern Illinois University, 1984.

VI. Q. Evaluating Interpretive Programs: A Challenge for the Future

Charlotte F. Young, University of Michigan, Ann Arbor.

Budget restrictions have caused park personnel to question whether interpretive services are effectively meeting their intended purposes. Personnel are interested in whether interpretive services are cost effective, if they really add to visitor experiences or aid in managing visitor behavior. Hence, more evaluations are being conducted (Cooperative Extension Service, 1979; National Park Service, 1983; Roggenbuck, 1979; Lime, 1979) in order to analyze whether these services are meeting their intended purposes.

However, "little systematic evaluation of the effectiveness of programs has (actually) taken place" (ERIC, 1981). Yet, additional research which documents the effectiveness of interpretive programs is necessary (Morfoot and Blake, 1979).

Indeed, evaluation is an important part of interpretive programming. However, it is not an easy process. This paper will focus on the various challenges and subtleties that were encountered with interpretive evaluation at Indiana Dunes National Lakeshore (INDU).

Methods

Defining Program effectiveness. Program effectiveness was defined in three ways: 1) extent to which pre-stipulated program objectives were met, 2) changes in participants' cognitive, affective and psychomotor behavior, and 3) changes in participants' schematic differentiation about dunes.

Study Site and Study Population. The study was conducted at West Beach at Indiana Dunes National Lakeshore. The study population consisted of organized groups of fourth to sixth graders (n = 498) from nearby the Lakeshore.

Study Design. A two-by-two factorial pretest-posttest control group design was used.

Individuals were randomly assigned to control or experimental groups. They were then assigned to one of four program types (large activity, small activity, large lecture or small lecture). In addition, six individuals, from each control and experimental group, were randomly chosen for observation.

Instrumentation. Several instruments were developed to measure program objectives that INDU staff developed. Two kinds of games, a crossword puzzle and matching game, were designed to measure participants' knowledge. Questionnaires were designed to solicit participants' attitudes. A behavior intention "story" instrument was used to measure participants' "behavior" before the program as they were tested in schools, not at the park. Participants' behavior after the program was measured using observation. Identical instruments were not used because frequently individuals were tested two days in a row.

Results and Discussion

Instrument Reliability. The results suggest that the instruments were not highly reliable, even though extreme care was taken in instrument design (consultation with evaluation specialists, pilot testing, and development of several draft instruments). The largest (Pearson's) correlation between parallel test items was .305 for the crossword puzzle and .521 for the matching game. The largest correlation between parallel attitude test items was .461. Between the behavior intention story and observation, the largest association (Cramer's V) was .401.

Interpretive Program Evaluation Methods. In interpretation research, researchers have inferred what methods are most suitable for measuring effectiveness. Yet, "every method's validity has to be empirically tested in the different situations where it is to be used," (Magnusson, 1967). In other fields, measuring concepts using several methods and then looking for convergence among these methods has been an excellent way to validate the concepts and the methods (Kidder, 1981).

Pearson's correlations were used to determine whether methods (games, questionnaires, behavior intention stories, observation) could be used interchangeably to measure a particular characteristic (i.e., a trait "environmental behavior"). This trait was operationalized to have cognitive, affective, and psychomotor (behavior) components. The subject matter, or content, of this characteristic was based upon the program objectives. For instance, the cognitive component consisted of information about protecting plants and animals, plants preventing erosion, a dune and a successional community. If the methods used to measure the components of the "environmental behavior" trait were strongly correlated, then one method of measuring the trait would be substitutable for another method.

The correlations between the methods were varied. The positive correlations between the methods ranged from .968 (behavior intention stories and pretest questionnaire) to .055 (behavior intention stories and posttest questionnaire). The negative correlations between the methods ranged from -.135 (behavior observation and posttest questionnaire) to -.061 (behavior intention story and posttest game).

These results indicate that the majority of methods cannot be substituted for one another. It may be possible to substitute the pretest questionnaire with a pretest game or behavior intention story. It may also be possible to substitute the pretest game with the behavior intention story. However, these substitutions must be made very cautiously for several reasons.

First, the method test items were not very reliable (See above discussion.)

Second, the pretest questionnaire was more strongly correlated to the knowledge instruments than to the posttest questionnaire. In other words, the correlation between the same method (attitude instrument) (i.e., reliability correlation) was smaller than the correlation between two methods (questionnaire and knowledge instruments) (i.e., validity correlation). However, the validity correlation(s) should be smaller (approximately .5 - .7) than reliability correlation(s) (approximately .7 - .9) (Kidder, 1981). This further suggests that substitution should be carefully executed.

Third, the correlations were found for instruments with specific content, so, if the content of the instruments were changed, the substitutability may also change.

Finally, "environmental behavior" was very broadly defined. It included content information from the cognitive, affective, and psychomotor realms which were not known to be related. In psychological testing, however, correlation analysis for different methods has been used on content that is more defined (depression, for example). The content included in the methods used to measure the trait is known to be related. For instance, people who are depressed behave in certain ways, and tend to have certain attitudes. Hence, to validate methods, researchers might use observation to watch these behaviors and perhaps a questionnaire or interview to find out about their attitudes. The methods would then be correlated to determine if they could be used interchangeably.

Knowledge Instruments. The number of "partially correct" answers that were given for the knowledge information suggest that developing instruments to measure respondents' knowledge accurately is a much more difficult task than simply designing a quiz. The data indicate, for instance, that a greater percentage of experimental individuals who completed the crossword puzzle answered partially correct for program objective number three (know plants/animals are protected) on the pretest (18.3 percent - 32.9 percent partially correct) than on the posttest (5.2 percent - 14.6 percent). This same general pattern was found in nearly all other cases, for individuals who completed the crossword puzzle as well as the matching game. In other words, in many cases, individuals got a greater percentage of "partially correct" before they were exposed to the treatment than after, while the percentage of "correct" answers remained approximately the same before and after the treatment (for example, matching test respondents in the experimental, large lecture mode for program objective 4 (know plants/animals have specific habitats) scored 65.5 percent correct on the pretest, 64.3 percent correct on the posttest). It seems that students might have been guessing on both the matching game and crossword puzzle because a greater percentage answered "partially correct" on the pretest.

Large differences in the percentages "correct" were identified for the two different types of knowledge tests (for example, 62.8 percent correct for the crossword puzzle respondents, and 38.5 percent correct for matching game respondents exposed to the large lecture programs for program objective 3 (know plants/animals protected)). This situation may have been due to the nature of the tests. The crossword puzzle, which included spelling words, essentially measured participants' ability to put a word in the correct place, and hence may have been easier to complete. The matching test, on the other hand, provided no "clues" about the "correct" answer and therefore, may have been more difficult to answer.

In addition, the matching game may have measured participants' knowledge more sensitively because respondents needed to complete four parts for each question rather than simply filling in the blanks. Therefore instrument types, other than a crossword puzzle, such as the matching game, should be used.

However, the matching game also seems to be somewhat problematic. When students did the pretest matching game they finished it very quickly (approximately two-thirds finished it in about five minutes). When they did the posttest they took longer, perhaps because they might have thought more about which answer was correct as they had just heard the answers plus other relevant information.

Attitude Instruments. Developing sensitive attitude measures is another complicated aspect of program evaluation. Attitudes are highly interrelated, and in order for one attitude to change or shift, it may be necessary that several other change or shift also (Shafer and Tait, 1981; Peyton, 1982). Hence, individuals' attitudes may have shifted or changed on a "micro-level," but the instruments would not have clearly measured these "micro-level" shifts and possible shifts in interrelationships between related attitudes.

In fact, the data seem to suggest that "micro-level" attitude shift may have occurred, even though statistically significant shifts often did not occur. For example, experimental large lecture individuals' feelings about nature parks did not change statistically significantly (Z = 1.63, P-value = .104), yet more students (experimental mode) felt very good about nature parks after they were exposed to the program (66.9 percent) than before (55.7 percent).

Behavior Instruments. The complexity of behavior and behavior intention make it very difficult to measure these phenomena reliably and validly. For example, most students (61.7 percent to 85.9 percent) indicated they would put their trash in a trash can. But only 0.0 percent to 20.8 percent actually behaved this way. These results suggest that measuring behavior intention is not necessarily an accurate way to measure behavior.

In addition, the types of answers that were provided may have been problematic. Questions two and three contained more than one appropriate answer. Although only one answer was "correct" according to the program objectives, other answers were not really incorrect, such as "ask the ranger if you'll see other similar plants later on." Hence, this situation points to the need to distinguish between correct and appropriate behavior.

Also, the content of the stories may not have been as appropriate as it should be. Questions two and three asked respondents how they would behave on or near a trail if they saw an interesting plant or animal. While these stories may give some indication of the staying-on-the trail behavior, other stories may be more appropriate. A story that asked participants if they would run down a vegetated dune or stay on a flat trail might give a better indication of their behavior.

Developing Program Objectives. Another common problem with evaluation studies lies with the program objectives themselves (Theobald, 1979). The percentage in the program objectives were not met for nearly all objectives for both the control and experimental individuals' posttests. While this result is expected for the control group, experimental groups should have come closer to meeting the program objectives. The objectives may have been set too high. Program evaluators (Rossi, 1972) have recommended that objectives should specify a success rate around 50 percent. Most of the program objectives for this study specified 80 percent to 90 percent success rate. If a success rate of 50 percent had been stipulated, however, other problems may have resulted. Most all knowledge program objectives would have been met on both the pretest and posttest for those who filled out the crossword puzzle. Most of the attitude objectives for both pretest and posttest, and all the behavior objectives for the pretest would also have been satisfied. Because these problems exist, setting the objectives around 80 percent to 90 percent may have been appropriate. These success rates, however, will probably not be achieved with a single visit (in future). As the objective success rates were not achieved and setting them at either 80 percent to 90 percent or at 50 percent creates problems, it may be more appropriate to try to examine changes than may have resulted from the program.

The objectives are vague in other ways as well. Program objective one says "marram grass and other plants" but other plants were not defined. Program objective four says a "common dune animal and plant;" again, these organisms were not specified. The ambiguity of the program objectives suggests that program evaluators need to think very carefully about the program objectives before the objectives are developed. The vagueness of the program objectives also suggests that specific information needs to be included in program objectives in order to facilitate development of reliable and valid instruments.

Program Content. The program content did not specifically address appropriate attitudes that individuals should have as a result of the program. For this reason, attitudes may not have changed. For example, 61.7 percent of individuals in the large activity experimental group felt very bad about litter on the pretest and 68.8 percent of the individuals felt very bad on the posttest. Since information about desired attitudes was not overtly given, and it is generally agreed that attitudes are learned (Fishbein and Ajzen, 1975), individuals probably kept attitudes that they had (always) maintained in the past.

In addition, program content was not geared toward behavior and behavior change; rather the majority of the information focused on ecological facts and concepts. While knowledge of these facts and concepts may be related to the behavior that an individual exhibits, the relationship is not direct. In other words, participants can know and feel a desired way about a certain behavior but not actually behave that way. Indeed, the data suggest that this situation is exactly what is happening. Participants generally felt that litter was bad or very bad (58.4 percent - 69.4 percent for experimental individuals) and they also indicated that they knew appropriate litter-disposal behavior. However, most individuals did not properly dispose of their trash. Since the relationship between behavior and knowledge and attitudes (and values) is so complex, it may be necessary for park personnel to decide what domain they really want to affect and concentrate their program efforts on that particular domain.

Influence of outside factors. Numerous "outside factors," such as repeat visitation, media and teachers, influence students. Space limitations prohibit the discussion of these factors here.

Conclusion

The results of this study suggest that evaluating interpretive programs requires consideration of the various subtleties inherent in the process. Overall, we need to more realistically define the impact of programs on participants, design instruments that are found to valid and reliable, relate program content to program objectives, and acknowledge the influence of other factors on visitor behavior.

REFERENCES

"Cooperative Extension Service". Journal of Extension. 1979. (Quick, S. and Davis, K. "A Self-Reporting Evaluation Tool", pp. 20-25).

Environmental Education Program Evaluation. 1981. ERIC, ERIC/SMEAC. Fact Sheet #1, Ohio.

Kidder, L.H. (ed.). 1981. Selltiz, Wrightsmand and Cook's Research Methods in Social Relations, 4th ed. New York: Holt, Rinehart and Winston.

Lime, D.W. 1979. Visitor Observation: A Tool for Appraising Interpretive Activities, in Proceedings, 1979 AIN Workshop, Bloomington, MN. pp. 49-54.

Magnusson, D. 1967. Test Theory. Reading, MA: Addison-Wesley Publishing Co.

Morfoot, C.F. and B.F. Blake. 1979. "Interpretive Effectiveness: Improving Techniques of Evaluation." in Proceedings, 1979 AIN Workshop, Bloomington, MN. pp. 57-59.

National Park Service. 1983. Interpretive Effectiveness Research Project, funded by Eastern Parks and Monuments Association.

Peyton, R.B. 1982. "Outdoor Environmental Education," Department of Fisheries and Wildlife, University Course Lecture, Michigan State University, E. Lansing.

Roggenbuck, J.W. 1979. The Field Experiment: A Suggested Method for Interpretive Evaluation. J. of Interpretation. 4(1):9-11.

Rossi, P.H. 1972. "Testing for Success and Failure in Social Action." (in Evaluating Social Programs. Rossi, Ph.H. and W. Williams (eds.). New York: Seminar Press).

Schafer, R. and J.L. Tait. 1981. A Guide to Understanding Attitudes and Attitude Change. North Central Regional Extension Publication, 138, Ohio State University, Extension Sociology Committee.

Theobald, W.F. 1979. Evaluation of Recreation and Park Programs. New York: John Wiley and Sons.

VII. Presentations:
Environmental Education Methondologies

VII. A. Outdoor Education is Special

Jeanne V. Ackerman, Cindy Lins Montgomery County
Public Schools, Rockville, Maryland.

Strategies and activities for providing outdoor education experiences for students with behavioral problems, learning problems, and orthopedic handicaps were presented, including demonstration activities and a slide presentation.

VII. B. Environmental Issues: An Experiential Approach for Upper Level University Courses

Cheryl Alexander and Marc Bell, University of
Victoria, British Columbia.

This presentation outlined an experiential approach to educating undergraduates from many disciplines for making decisions on environmental issues. This approach has been developed as the core course of an interdisciplinary undergraduate environmental studies program at the University of Victoria. It emphasizes student-initiated learning, with instructor guidance, through the use of small group techniques, exploring real community issues, use of industry and government resource people, and development of communication and facilitation skills. Team research projects and contract learning are major elements of the course.

VII. C. A Floating Classroom on Golden Pond

Richard F. Ashley, Science Center of New Hampshire.

Teaching limnology to the lay public is the major subject of this paper. The Science Center of New Hampshire in Holderness has been operating a 28 foot pontoon boat on Squam Lake and Little Squam Lake for the past two years. Over 200 classes (more than 2000 people) have taken part in 2-3 hour limnology class. About 50 percent of the participants were adults and 50 percent were school age students (Junior and Senior High).

It is important that any curriculum involving lake study include references to fishing, acid rain, and other topics currently of interest to the participants. It is also vital to the educational value of the program that all concepts be closely interrelated. For these two reasons, we have found it best to look at the lake community as a changing ecosystem and specifically to consider those changes that would be included in eutrophication, stratification, and pollution.

Eutrophication, or the "aging" of a lake, is a difficult concept to present to the general public in any form. We have found that one good approach was to relate it simply to the filling in of the lake with the bodies of dead plankton. Assuming that eutrophic processes were at least 15,000 years old, we collected a mud sample using an Ekman Bottom Dredge, examined the black jelly-like quality of the sediments, and concluded that the material was not brought in by rivers and streams. As any lake becomes more shallow, more of the bottom is taken over by vascular plants; the nutrients from bacterial decay are more readily available to the algae in the surface waters. The result is an aging process which proceeds faster with time. The concept of succession and the gradual change from lake to pond to marsh to field to forest can be easily introduced into this part of the curriculum.

Stratification, or the layering of a lake, is a more exciting concept because many of the measurements seen throughout the summer and taken during each class reinforce the idea that there are two separate systems within one lake. A water sample from the hypolimnion will show higher and higher concentrations of carbon dioxide, which in turn will lower the pH. Because the two layers do not mix during the summer months, the depletion of oxygen from the bottom of the lake can be directly related to fishing. In Squam Lake, for example, trout fishermen begin the season by fishing for trout in shallow water. As the surface water warms, the trout go deeper and the fishermen move to the deeper parts of the lake. As the bacteria use up the oxygen in the hypolimnion, the trout move to higher levels and most good fishermen begin to use down-riggers and sonar. In Squam Lake the temperature of the epilimnion may go as high as 25 degrees Celsius, while the hypolimnion drops as low as 9 degrees Celsius. By using a LaMotte water sampler to collect water samples from 25 to 30 meters, oxygen and temperature measurements can be directly related to the suitability of the habitat for fish and to the concept of stratification.

Because of the widespread interest in acid rain, it is vital to have an accurate means to measure the acidity of lake water. For the lay public, any kind of electric pH meter cannot be expected to last under constant use and abuse. Hach Chemical Company makes a kit which allows quick and easy measurements to be made with an accuracy of 0.1. We have also found the kits to be quite easy for the public to understand. While measuring the pH of the water, it is important to clarify three points:

1) each whole increment on the pH scale is a tenfold difference; pH of 6 is 10 times more acid than 7, or neutral. A reading of 5 would be 100 times more acid than 7 and 4 is one thousand times more acid;

2) Normal rainfall has a pH of 5.6 because carbon dioxide from the atmosphere enters the falling rain drop, combines with some of the water molecules and produces a weak carbonic acid solution;

3) The term "acid rain" is used to refer to rain with a pH reading below 5. In central New Hampshire the rainfall has an average pH of 4, with extremes going from 3 to 5.

Water hardness, as a measurement from the floating classroom, has a dual function. For most testing kits it is actually a measurement of the calcium carbonate in parts per million in the lake water. A reading of 0 to 60 is soft water, 60 to 120 is medium hard, 120 to 180 is hard water, and over 180 is very hard water. Many visitors to the shores of Squam Lake discovered that it was a great place to wash their hair and as a result polluted the water with the phosphates in their shampoo. The practice has now been banned, although many lake shore residents still pump lake water directly into their homes. The calcium carbonate measurement is also important to the acidity of a lake, and is often called the alkalinity test. Deposits of calcium carbonate in the watershed of a lake will greatly help to neutralize the effects of acid rain. Over a period of several years, a steady decline in this mineral in lake water might indicate that the acidity of the rain is gradually using up the ability of the lake and watershed to buffer acid deposition. While the pH of Squam Lake has been 6.7 for the last ten years, we have every reason to believe that the calcium carbonate in the water is gradually being depleted.

The pollution of a lake by the activities of people should always be a prime focus for a limnology class. In our experience, however, many myths must be dispelled before relevant concepts can be understood by the general public. Algae are to a lake what grass is to a field and trees to a forest. It is the basis of an elaborate food pyramid with a loon or a merganser at the top. Unfortunately, the term "algae" is too often associated with pollution, in the minds of the general public. For this reason, near the end of each field trip we use a plankton net to collect both phytoplankton and zooplankton. A large net is used for a vertical plankton tow and a smaller net is pulled behind the boat for about five minutes. We then use a bioscope (projecting microscope) to project the living material on a large screen for identification and discussion. At first, most people are horrified to see such a diversity of animals in their water supply. Gradually, however, they come to understand the important role played by plankton in the lake community. We also use a secchi disk to measure water clarity. This device is useful because it is a quick measurement of the quantity of microscopic life in the open waters of a lake. The secchi depth, or the point at which the disk first disappears, is also the point at which 95 percent of the surface light is gone. This depth is almost the limit for algal growth. A discussion of water clarity should dispel the notion that a clear lake is a clean lake. In actuality, a clear lake might be unproductive or dying from acid rain.

Coliform bacteria are normal residents in the intestines of warm-blooded animals. The total count of these bacteria is used to rate different lakes. A class "A" lake has fewer than 50 coliform bacteria in 100 milliliters of water. A class "B" lake has from 50 to 240 and a class "C" lake has from 240 to 1000. People in New Hampshire are keenly aware of this classification because it has a relationship to property values and the uses that can be applied to a lake shore development. As an example, it would be much more difficult to stop the siting of a large industry on the shore of a class "C" lake than on the shore of a class "A" lake.

Millipore Corporation makes a small portable filtering device and 0.45 micron filters which trap coliform bacteria. These filters are then placed on a suitable nutrient agar or nutrient pad and incubated for 24 hours. The coliform count can be done without a microscope, although some form of magnification is useful if a high degree of accuracy is desired. Millipore publishes a flyer on the use of its equipment. In order to carry out accurate coliform measurements on lake water, and in addition to the above equipment, one must also have an autoclave (or short wave UV lights), an incubator, and a source of distilled water. Although coliform bacteria do not cause disease, they are one of the best indicators of human pollution available. When the public learns that there is a direct route between their water supply and a warm intestine, they become very interested indeed.

All of the data collected on the Squam Lakes has been stored on a computer disk (Apple - PFS) for easy recall.

VII. D. Conservation Education in Missouri

Larry Behrens, Conservation Education Consultant,
Missouri Department of Conservation

Since 1941, the Missouri Department of Conservation has consistently supported a formal conservation education program through the established system of public, private, and parochial schools. Its Education Section's staff is comprised of professional educators with actual instructional experience.

The Conservation Commission is charged with the responsibility for fish, forest, and wildlife resources. The Commission recognizes, however, that each of these resources depends on the land. Therefore, the Missouri Department of Conservation focuses its formal education programs upon all resources. Its Education Section provides programs based on ecological concepts and a philosophy of wise use.

During the 1984-85 school year, the Conservation Education Unit, supported by fourteen Conservation Education Consultants headquartered throughout the state, introduced four new programs. These programs are provided at no cost to eligible participants, and are made possible by broad-based citizen support of conservation in Missouri.

"Conservation Seeds" is a planting program, but not the usual kind. The "seeds" are ideas to be planted in the most fertile medium of all--the minds of young children. It is a comprehensive conservation awareness program designed for three to five-year olds. Its purpose is to help early childhood teachers heighten children's awareness of nature and conservation. "Conservation Seeds" consists of an instructor's guide with suggested teaching activities for each of the four seasons. In addition, each participating teacher receives four original posters, each depicting a different season and land-use theme. Animal cards and animal habitat posters are also a part of this unique program.

An elementary school conservation education program entitled "Learning With Otis" is available to teachers and students in grades 1-6. Otis is a cartoon mouse who is the spokesman for the program. Each teacher enrolled in the program receives a teacher's activity book for his or her grade level. This book is the heart of the program and is designed to help teachers incorporate conservation concepts into the existing curriculum. The book is divided into eight sections treating ecology, geology, soil relationships, land use, conservation ethics, wildlife, plants, and water and aquatic life. An average of five lesson plans per section is provided. Each lesson plan identifies the conservation concepts and State Department of Elementary and Secondary Education objectives to be treated. Four times during the school year, teachers receive classroom quantities of "Notes from Otis," a supplementary student newspaper. Through these newspapers, Otis presents important conservation messages, announcements of special events, stories and puzzles. Otis also keeps in touch with teachers via teachers' editions of the newspaper.

The Conservation Education Unit has begun development of a series of instructional units for teachers of grades 7-12. The units available to date are, Biogeography of Missouri, Soil Formation and Distribution in Missouri, Ecology of Missouri

Forests, and The Missouri Deer Game, a role-playing activity which addresses carrying capacity. Additional units applicable to teachers at all levels are An Ecological Approach to Conservation Education and A Glossary of Selected Terms of Conservation, Ecology and Resource Use.

"Missouri Conservation Frontiers" is a conservation action program for Missourians ages 8-80. The program is designed to reward completion of conservation activities, conservation merit badges, 4-H conservation projects, and other related achievements. Teachers may involve their students in "Frontiers" as the award component of the "Learning With Otis" program. In addition, parents may direct their own children's participation without youth organization affiliation. Citizens of all ages, sportsmen's groups, garden clubs, etc. are invited to participate, learn, enjoy, and benefit by becoming involved in this conservation effort.

In addition to promoting the previously described programs, the Department's fourteen conservation education consultants are available to assist educators in schools and colleges who want to include conservation education in their instructional programs. Conservation education consultants offer courses and workshops to help educators improve their ability to teach young people about wise resource use. Courses and workshops may vary in length from a half day to a full college semester, and many are offered for graduate credit through local colleges and universities. Mobile courses put the classroom on wheels as participants visit important ecological and resource areas throughout the state. Conservation education consultants also provide assistance in developing and using outdoor classrooms.

VII. E. The Local Community as a Laboratory for Global Understanding

Richard C. Berne, Center for Environmental/Energy Education, Western Carolina University.

Issues facing local communities provide excellent research opportunities which excite students and provide a basis for the development of problem-solving skills and supportive subject matter concepts. As students get involved in an objective investigation of local issues, they acquire a "need to know." The skills, concepts and attitudes inherent in such studies are the processes and products of scholarship. When students are studying real life situations, learning becomes meaningful, because it is needed by the students.

By examining their own surroundings in depth and then comparing their area to another, both teachers and students learn to understand relationships, develop historical perspectives, and begin to infer trends. They learn to use their own communities as a microcosm of principles that remain valid on a global level.

By their very nature, youth are interested in the future, and many young people today have valid concerns related to "progress toward a sustainable future." Their innate interests can be awakened to the exciting potential of their personal involvement in the development of solutions to problems facing society, both now and in the future. Global interactions of mankind and the natural resource base provide a vehicle for multidisciplinary studies, including environmental, cultural and economic issues.

Assessing the Progress and Benefits

1. Meaningful Learning. Familiar surroundings provide real situations.
2. Added Resources. Talents and facilities of the community become a part of the school.
3. Increased Goodwill. Involved people from the community are more interested in the schools.
4. Increased Self-Esteem of Students, Parents, and Teachers. People see value and purpose in education.
5. More Information Available. Information gathered by students becomes available to decision makers in the community.

Getting Started

The operational philosophy of a community-studies program is that of an investigative approach, building on the humanities and the natural sciences. Scientific skills and processes can teach children how to approach a new problem, while the cultural concerns of the humanities provide a basis for forming values to put the problems in perspective. Thus, the qualitative perspective of the humanist, in combination with the quantitative findings of the sciences, provide the basis for a unified understanding of people and the world.

Have social studies and science teachers interact in developing a list of local issues. Resource persons from the community might be called upon to assist in making such a list. Students should then be asked to develop their list, later identifying topics for their individual or small group research projects.

Students need instruction in types of research, research techniques; frequently, special sections of science and social studies programs must be devoted to instruction in methods of research. Typically, products may be either individual or group efforts.

Projects may include:

1. a booklet of individual and group research reports;
2. a book about the community: its heritage, current changes and future;
3. exchanges between schools of students, teachers and administrators based on comparative studies of respective communities;
4. slide-tape productions on special community issues;
5. community festivals allowing young and old to celebrate the community's strengths;
6. conducting opinion polls;
7. producing a play;
8. developing computer models;
9. producing a newsletter for cooperating schools;
10. having students appointed to community boards, committees, etc.;
11. photography shows;
12. field trips to special places;
13. producing a new course of studies which integrate the sciences and humanities;
14. producing a land-use plan for the community;
15. supporting or resisting particular pieces of legislation.

One of the most successful and productive of our projects was the exchange program based on comparative studies of different communities. Such studies require careful planning involving students, teachers, school administrators and other members of the local communities. If overnight visits are made, the host-family arrangement works very well.

1. First, the partner school is chosen and the schools agree to do similar studies.

2. Students of similar interest should be matched up so they can share information as they develop their respective studies.

3. Student and class products should be developed for presentation during the actual exchange visits.

4. During the visit, students should spend time in classes, meet informally with host students and teachers, compare results of their studies, visit community places of interest, and meet people of the host community who represent a variety of the local community's interests and issues.

In fact, based on student exchanges, several international teacher exchanges were developed with goals quite similar to those of the student exchanges.

Outcomes

Some or all of the following result from local studies as a basis for global understanding:

To The Teacher:

You will rethink what is taught and how you teach it.
You will learn more.
You will make increased and more effective use of community resources.

To The School:

There will be interest and support from the community.
There will be better mutual understanding between school and community.

To The Students:

They will increase their skills and understanding.
They will be more interested in school.
They will become involved in community affairs.
They will have increased pride and self-esteem and a sense of accomplishment.

Sources of Assistance

A successful school-community project must be built upon a foundation of a public schools-community collaborative effort. It is most helpful, if not essential, that a university or community college be involved from the very beginning. The post-secondary institution can be most helpful in assisting with establishing the general direction, goals, and continuing primary resources. Other sources of assistance are:

1. federal, state, and local governmental agencies;
2. local or regional utilities;
3. civic clubs;
4. chambers of commerce;
5. private individuals;
6. business and industry;
7. other education institution, such as: museums, research institutes, etc.

Major outcomes of local study programs have been identified. Student attendance in school increased. More students went on to post-secondary education. A better understanding among various interest and age groups was developed. Perhaps the most important gain was a sense of pride in the local community. Students experienced a sense of place and time which was reflected in greater caring about one's home, its past, present and future.

VII. F. Toward Global Awareness By Integrating Learning, Work and Service at Warren Wilson College

Woodward Bousquet and Ian Robertson, Warren Wilson College.

Introduction

Many institutions of higher education--and virtually all liberal arts colleges and universities--include learning, work, and service in their formal statements of purpose. That is, their established goals are to teach students an academic discipline, prepare them for future work, and assist them in developing the skills and values needed to be of service to humanity. Warren Wilson College, a small southeastern school, follows this pattern but differs in the way it achieves its goals.

To illustrate Warren Wilson's unique approach to higher education, this paper describes how two academic programs--the Environmental Studies Program and the International Development Program--integrate learning, work and service. In particular, the discussion centers on extended student trips designed to meet college goals while developing global awareness. The ultimate purpose in presenting these experiences is to identify their elements of success and encourage others with similar objectives to try these approaches.

Nestled in the Blue Ridge Mountains of western North Carolina, Warren Wilson College is situated in the heart of southern Appalachia. The 1000-acre campus includes forests, streams, farmland, fields and a river, as well as buildings that reflect a 90-year heritage.

The Work Program

Learning, work, and service have consistently guided Warren Wilson's 90 years. For example, the 1934 bulletin stated, "Work is at the center of farm school life and is both an essential element of a boy's education and his means of paying for it." Today, students remain the work force of the college. All students, regardless of family finances, work 15 hours a week in exchange for room and board. Warren Wilson's work program currently involves 64 student work crews whose tasks range from janitorial and clerical services to managing a 500-acre forest and organizing community workshops on local environmental issues.

It's not just work, however, but the kind of work that makes Warren Wilson unique. As a student you can feed hogs, load logs, weed, seed, and feed your fellow students. You can also compute academic fees and breakdown the college's budgetary needs.

Three key building blocks of sustainable development and global awareness are woven into Warren Wilson's work program: responsibility, participation, and cooperation. Responsibility is not just arriving on time for work; students are instructed in their jobs and are then expected to perform up to a standard. Initiative and creativity are rewarded in work grades and other evaluations, all of which become part of their college transcript.

The equity of participation, the second building block, also encourages involvement in planning and development for the college. Participatory democracy is put into practice with students serving as voting members on college committees including those dealing with land use, social regulations and curriculum. Finally, cooperation within the work crew for mutual support and safety teaches the essential elements of negotiation, mediation, and conciliation.

Extended Student Trips

Academic programs at Warren Wilson benefit in many ways from the responsibility, participation, and cooperation fostered by the Work Program. Students' growing self-esteem and interpersonal skills often carry over into class discussions, oral reports, independent study, and team projects. These payoffs have encouraged faculty to design additional learning opportunities to challenge students further and to take advantage of abilities that emerge from a student body well-acquainted with the world of work.

One such educational opportunity is the extended trip, which allows us to address many objectives we cannot attain on our thousand acres in western North Carolina. This section of the paper highlights two academic programs and describe their associated trips.

Currently in its ninth year, Warren Wilson's Environmental Studies Program offers three program options: environmental management, environmental education, and general environmental studies. Students interested in resource management careers elect the environmental management option. Coursework in applied sciences is supplemented by a summer forestry program and year-round work on the Natural Resources Work Crew which manages college-owned forests. Although Warren Wilson cannot offer the in-depth series of technical courses taught at a state university, the work crew gives students the opportunity to earn room and board by actually doing environmental management. The second option, environmental education, prepares students to help people learn about and protect the environment. Participation on the Environmental Studies Work Crew provides a valuable supplement to classroom studies and field experience in environmental education methods and curricula. The crew's accomplishments include a trail system, exhibits for the science building, a campus recycling program that is serving as a model for surrounding towns, Swannanoa River Awareness Week to study and celebrate our local valley and its resources, and a series of environmental forums and workshops ranging from organic gardening and Appalachian crafts to local planning and hazardous wastes. Finally, the general environmental studies option allows students whose interests do not fit specifically into education or resource management to design their own programs. Many departments have provided courses and counseling to help students link another academic discipline with environmental studies. Students have combined environmental studies with biology for a career in field biology, with chemistry for environmental quality monitoring, with art for design, and with sociology and economics for urban planning.

Students pursue coursework in both the natural and social sciences regardless of the option selected. Participation on the farm, garden, landscape, natural resources or environmental studies crews is encouraged, as are off-campus internships. Much of our academic strength comes from a heavy emphasis upon field work on campus, in nearby national parks and forests, and in a wide variety of human communities including the campus itself, rural towns, and Asheville, a medium-sized city only ten miles away.

One extended field trip in the Environmental Studies Program is Discovery through Wilderness. A demanding interdisciplinary course that attracts majors from many campus departments, Discovery through Wilderness is a month-long visit to a wilderness area in June, preceded by spring semester preparation at Warren Wilson College. Two professors alternate teaching the annual course, and each has selected a different mode of travel and place to visit so that students have a choice. Currently, one trip involves camping and backpacking in the Northern Appalachians (the Catskills, New England, and Atlantic Canada), while the alternative explores the Boundary Waters and Quetico Superior Parks by canoe.

The overall purposes of Discovery through Wilderness are several:

1. To experience wild places...Students live in close association with the natural world as they plan activities around sunset, sunrise, the weather, and the terrain; they acquire a "sense of place" about the region.

2. To explore new ecological settings...Boreal forests, sphagnum bogs, Canadian lakes, alpine tundra, and sea cliffs are among the many places encountered and studied.

3. To understand cultures...The varied ties between a region's land and its people are a central theme of the course--the Shakers' quest for simplicity, Yankees of yesterday and today, the voyageurs' search for furs in the Great Lakes region, maritime pursuits in Atlantic Canada, and resource management practices and policies.

4. To conduct field research...Participants in Discovery through Wilderness set up a study, carry it out during the trip, and then summarize their results in a written paper and/or oral report.

5. To live cooperatively...The group plans, lives, works, travels, eats, and plays together in sometimes relaxing and sometimes trying situations. Meeting this objective is always a challenge, and potentially a rich experience.

Class preparation during the semester before the trip involves organizational details, first aid training, team building, learning wilderness living skills, and extensive reading and study about the cultural and natural history of the region to be visited. Building upon work program experience, students assume a high degree of involvement and control in the course. In small committees they plan menus, monitor the budget, purchase groceries, keep track of cash, make inquiries and reservations for accommodations and special programs, and select some of the places visited and routes followed. These responsibilities pose challenges, not all of which are met successfully. Students also take charge of a great deal of the teaching in Discovery through Wilderness. During the spring semester, each course participant (including the instructor) studies a topic of interest such as mountain ecology, coastal cultures or music and then gives a pre-trip orientation to the rest of the group. Later, on the trip itself, the student shares his or her knowledge at appropriate places and times.

Past experience has shown us that questions and organizational details can consume a great deal of class time before the trip. It would be easy for academics to take a back seat. Therefore, we designed a separate course that focuses students on investigating the relationships between wilderness and cultures in the region they will visit. They earn two credits for this course, in addition to the four credits they receive for Discovery through Wilderness.

Between eight and twelve students take Discovery through Wilderness, and there is often competition for the available space. Each potential participant fills out an application form stating reasons for wanting to go on the trip and describing the skills and interests that he or she would bring to the group. Costs are reasonable. For example, the 1985 trip to the Northern Appalachians lasted 35 days and covered nearly 5000 miles on the road. Expenses--food, campsite fees, travel and miscellaneous charges--came to $380 per student. One can almost argue that students would lose money if they stay home.

The International Development Program combines academic courses at Warren Wilson College with hands-on service projects in developing countries. On-campus training includes a global issues course, cultural orientation to the host country, group dynamics exercises, and the study of appropriate technology skills. Students then put this learning into practice in an overseas project that usually lasts eight weeks.

The international experience integrates learning, work, and service in a manner designed to address five goals:

1. The Global Issues course gives a macro look at international events, people and places. In subsequently traveling to a third-world village and laboring with the villagers, global issues become human issues.

2. Field studies of human communities are taught at Warren Wilson and then used in the host country as a tool for understanding that nation's problems and challenges.

3. Each student keeps a personal journal which is both self-reflective and reflects upon the surrounding culture.

4. Students participate in group dynamics exercises and use the skills they acquire to build harmony and negotiate within the group.

5. At Warren Wilson, the group learns and tries out appropriate technology ideas they will use on the project. To us, "appropriate" technology can be a compost pile, but it can also be a computer.

All service projects are chosen according to their potential to reflect these five program goals. The college never initiates a project, however. Instead, faculty members make personal contacts with small organizations around the world explaining our skills and limitations. Then we wait to be invited.

The Dominican Republic trip in the fall of 1984 grew out of contacts made during a previous college service trip in 1982. Our goal was to begin constructing a medical and nutritional clinic on the outskirts of the village of San Francisco de Marcoris.

Upon our arrival, the clinic site was still housing a first-through-eighth-grade public school. Local bureaucrats had not acted to move the classes to another location as planned so that work on the clinic could begin. Parents and students assured us that signs of our impending demolition of the old school building would jolt their local officials into action, so we began digging the clinic's foundations by hand. Although labor was backbreaking and frustrating--given the quality of our tools--the first shovelful of earth represented an assortment of plans, dreams, and aspirations. Within five days, the school furniture was moved and demolishing the old building began in earnest.

Appropriate technology became a blistering reality, literally, after the clinic foundations were marked and we picked up shovels. Our Warren Wilson group discussed how a back hoe would greatly speed construction, bringing a needed clinic to San Francisco de Marcoris that much sooner. It became apparent, however, that many villagers were unemployed; any heavy equipment would eliminate more already-scarce jobs. Our Dominican co-workers' ability to sustain an eight-hour work day of heavy labor drew great respect from the students. That respect changed to curiosity and--after studying the diets of the workers--further appreciation of bananas, beans and rice as staple foods.

The global issue of third-world debt became a frightening reality when our group was the object of a local demonstration. The subject of the demonstration was austerity measures demanded by the International Monetary Furd. Resulting savings could then be applied to the Dominican Republic's debt, yet these measures would lower the standard of living in our host village. Since the United States is seen in many countries as the Fund's major decision-maker, we Americans were blamed. Student reactions, besides concern for their personal safety, were varied. "You would think they would be grateful for any help," stated a junior from South Carolina. Retorted an Ohio junior, "This cash crop economy installed by the United States is the cause of the Dominican's problems." These responses, plus scurrying around for information about the International Monetary Fund, created an instant field study. The end result was a number of meetings between the student demonstrators and our students. Both sides shared ideas and developed mutual respect as a global issue became a personal, human issue.

The clinic's walls continued to rise from sweat and joint labor. The bonds between new friends became as strong as the mortar of our new building.

Elements of Successful Extended Trips

Warren Wilson College has sponsored over a dozen extended trips through the Environmental Studies Program and the International Development Program. What follows are five key points, distilled from many experiences, that have become essential elements in the success of our student trips.

1. Clearly Communicate Your Program. Hold informational meetings before registration so that students can get as clear a picture as possible of the trip's objectives, academic requirements, costs, obligations, and schedule. Students are generally lured into these trips by their expectations of a vacation, fun and relaxation. Professors, on the other hand, emphasize work and learning. The actual experience will fall somewhere between these two sets of aspirations, so pre-registration meetings are indispensable opportunities to share perceptions and clarify expectations. Handouts, a carousel of slides, and a question-and-answer session with students who have completed similar trips can be quite effective.

2. Share Responsibilities. If the professor takes care of all the trip details, students are denied valuable opportunities to accept and handle responsibility. Besides, if you, the instructor, choose a run-down campground, confuse menus, forget to reserve a tent, or select a poor travel route, you get all the blame.

3. Work Together Beforehand. During the semester before the Dominican trip, all participants worked on Warren Wilson's Garden Crew. The daily routine of morning meetings set a pattern of communication that everyone came to expect and rely

upon. In addition, the group tackled a ropes course and cooked some Dominican meals to gain experience in solving problems and carrying out living tasks together.

Pre-trip group exercises were also important in Discovery through Wilderness. Course members met weekly to plan the trip and share their growing knowledge of the region. With help from the director of Warren Wilson's Life-Work Counseling Center, the students and instructor took the Myers-Briggs Type Indicator and discussed how their different preferences could influence the way the group made decisions and worked with each other. As a "dry-run" and to refine outdoor skills, the students organized and went on three outings--two day hikes and an overnight backpack.

Ultimately, the objective of all this pre-trip interaction is to be able to get into the van on the first day of the trip with colleagues, not strangers. Group dynamics do not evolve rapidly or spontaneously.

4. Don't Leave Learning to Chance. Dealing with a multitude of trip details can overwhelm academic objectives. Instructors, therefore, must set aside specific times for learning. For example, a separate Global Issues course focused Dominican travelers on the effects that world-wide concerns would have on their host country, while a course entitled Wilderness and Cultures helped Discovery through Wilderness students investigate the multifaceted relationships between peoples and land in the Northern Appalachians.

5. Leave Personal Time During the Trip. On extended trips, the energy and support of the group can be so pervasive that people neglect to collect their own thoughts, look inward, and reflect on the places and the experiences. It seems impossible to get close to a location or a culture if a person is constantly clinging to familiar faces and situations. Thus, time away from others is important for both foreign trips and trips to foreign environments such as wilderness areas.

The Discovery through Wilderness schedule included several whole and half days "off" for relaxing, journal-writing or more vigorous activities of one's own choice. Despite the work planned, students on the international development project in the Dominican Republic also found free time. Each day one person was the "loafer" who performed only light household chores and had ample time left for personal pursuits. In addition, the group took two unscheduled three-day weekends after particularly hard stretches of work on the medical clinic.

Summary

This paper has attempted to demonstrate how extended trips can help an educational institution promote global awareness while integrating its goals of learning, work and service. Although Warren Wilson's work program is uncommon, and environmental studies and international development programs lend themselves particularly well to the type of learning experience described, we believe that the approaches explained here can be successful in a variety of educational settings. Proper attention to pre-trip planning, individual and group needs, and academic objectives will pay substantial dividends not only during the extended trip but long afterwards.

VII. G. LEEF Alive

Judith A. Breuggeman, President, League of Environmental Educators in Florida.

The League of Environmental Educators in Florida (LEEF) is a diverse group, formed four years ago in response to the environmental crises facing the state due to rapid population growth and unplanned development. LEEF provides a community-based and -oriented support system, in which multi-faceted environmental programs are designed, tested, and implemented.

VII. H. Never Too Young

Virginia M. Caruso, Kennesaw College.

The earlier one gets involved, feels comfortable, and succeeds, the better are the chances this individual will continue with the experience. With involvement and success, comes interest.

Therefore, I am excited to be able to share with you an outdoor program which provides children at a young age (ages 3 to 5 years) with opportunities to participate in outdoor education. The types of "experiential" environmental awareness programs offered for this age group include camping, boating, and nordic skiing. This session describes the camping-oriented program.

The "camping" environmental awareness program may consist of one or two days, without an overnight. If the program is set up for one day, parents are asked to leave, then return to participate in the last activity. The actual experience for the youngster on a one day camping experience includes:

Introductory Games: Nature-oriented games which help to let youngsters meet others in the group, e.g., name games with animal movements, sounds or shapes. These games help the "little" ones to overcome "shyness" or "uncomfortableness" because their parent/guardian "big person" has left them in this new group.

Pitching a Tent: Using color codes, pictures, numeric or alpha symbols, children erect a tent.

Cooking Lunch: Using open fires, children prepare their own lunch by mixing contents, opening packages, measuring and pouring liquids, and serving each other. Children participate in cleaning, which includes not only washing hands, but also dishes, picking up trash, and cleaning the "camp" site.

Packing and Hiking: Using themes, language concepts, and environmental awareness ideas, children learn to select and pack "essentials." They carry their day pack while exploring, studying, and experiencing nature on a hike.

Firebuilding: Children learn about fire safety and identify elements for building a fire.

Treasure Hunt: Using a "symbolic" map of the area and a compass which has been color-coded, children uncover a hidden treasure.

Time is allotted for "quiet time" (rest) and closing activities. In all activities, awareness of the environment is the central focus. At the end of the first day's activities, children return home.

When a second day is scheduled, the parents are involved. Roles of each participant are changed. There are sessions where the child interacts solely with the parents, and when parents interact solely with teachers and staff.

Parents are asked to bring the child to the outdoor site, be responsible for their behavior, and to play the learner's role by performing exactly as the child indicates. (Children were told on the first day that they would be teaching their parents). Activities are similar to the first day, but usually the dessert, treasure hunt directions, and other minor details are changed.

What are some of the basic principles and procedures of this program? Some of the general characteristics of the youngsters are:

- Seeking approval and success
- Containing high energy levels
- Expressing their feelings
- Engaging in humor
- Desiring independence
- Remembering emotionally significant and concrete experiences
- Rapidly developing vocabulary and language.

Because of these general characteristics, the program provides for children's success and assists with their total development--physical, social, emotion, language and conceptual development, while being totally emersed in the environment. It's experiential education--based upon one of the tenets of outdoor education "in, for, and about the outdoors."

A variety of procedures and teaching techniques are used. Some of these include:

1. Children and staff determine safety guidelines; using guided questioning techniques, three safety guidelines are established. These guidelines identify parameters for "roaming" free, obtaining permission to touch objects, plants, animals, or equipment, and providing children the option to participate or not.

2. Staff provide for success; children are allowed or guided in many activities to establish their own measure for success. For example, children determine when their hot dog is cooked to their own satisfaction or when a tent stake is buried deep enough in the ground.

3. Staff and parents are asked not to compare one child's work with that of another.

4. Staff uses techniques which are consistent with developmental stages of these children. Abstract concepts are taught using concrete examples, e.g., compass directions are color-coded and map symbols are pictorial representatives.

5. Staff are flexible in teaching units. This allows staff members to react to teachable moments.

6. Staff use multisensory approaches. In the activities, children listen for sounds, taste for flavors, observe shapes, identify textures by feeling, and determine aromas through smell.

The teaching aids may be creative, but the approaches are not new. Therefore, whether working in an educational institution, private or public agency, or nature facility, individuals can incorporate this program.

In establishing and implementing such a program, an individual should:

1. Identify, reserve, and coordinate all aspects of the program. This includes training staff to work with this age group, making travel arrangements to selected outdoor site, modifying equipment, and properly advertising.
2. Establish a meeting with parents prior to the child's participation. During this meeting, explain the program's activities, obtain emergency and medical information, and review foreseeable risks. Parents should be asked to sign an acknowledgement of risk form.
3. Analyze budget and equipment needs. This cost varies depending upon staffing, equipment, travel and food requirements. Depending upon the factors, an average cost is approximately $10 for a two-day program--excluding personnel.
4. Identify staff. A ratio of one leader and one assistant for 12 children is excellent. However, one staff to 15 children is good, depending on activity and teaching techniques.

One caution point is in order--to provide a better opportunity for children to have a positive experience, do not allow parents to assist staff. Many parents want to offer their assistance. However, if their child is involved, our program has shown this involvement detracts from parent-child interaction, does not allow for complete role reversals, and designates that their children may be "special" from the others. Therefore, the program must be operable without parents substituting for staff.

In concluding, some of the comments and impact of this program include several components:

1. Although one leaves the camp physically tired, the reactions from participants and staff can be summarized as an "extremely enjoyable and rewardingly educational" experience. Research suggests that a two-day experience may not be enough to permanently change human behavior, but we have found that it affects attitudes--pleasant memories stay always in the minds of children.

2. Children who were never in outdoor settings before learn to enjoy it, while others have new experiences.

3. Parents return rate to outdoor sites is between 75 to 80 percent. Many had never been in outdoor settings--and want additional followup experiences for children.

4. Retention rate of children over one year is excellent. Sometimes terms are forgotten, but descriptions are fairly accurate.

5. Children's attention span and on-task behavior increases in this outdoor program when compared with classroom activities.

VII. I. Exploring Environmental Issues with Gifted and Talented Students: A "Hands-On" Approach for Students and Teachers

Randall B. Champeau and Richard J. Wilke, University of Wisconsin-Stevens Point.

A process was designed to incorporate gifted and talented methodology into community environmental issues investigations for students in grades 6-12. After a workshop on the process, ten area teachers facilitated a two-week issue investigation with fifty participants attending the 1985 University of Wisconsin-Stevens Point "Youth in College" program.

VII. J. Profiles of Wolfe Island

Hendry Connell, Kingston Collegiate Vocational Institute, Kingston, Ontario.

Wolfe Island, situated at the eastern end of Lake Ontario, is unique. All of the water of the Great Lakes watershed flows around it. This presentation involved an explanation of a semi-isolated life style, farming and fishing as it has remained for many decades. The concept of sustainable yield was stressed. The implication of an Ecosystem Approach in education was mentioned.

VII. K. Environmental Education Developments in Canada's Youngest Province-Newfoundland

Richard F. Coombs, Roman Catholic School Board, St. John's, Newfoundland.

Environmental Education as a dimension of the formal education system is coming of age in Newfoundland. Through the cooperation of educators, business, industry, and government, some exciting and innovative experiences are being provided for teachers and students.

VII. L. Field-Research for the Student

Rosi Dagit and Bruce Rinker, Langley School, McLean, VA.

"In the field of observation, chance favors only the prepared minds." Pasteur's statement summarizes our goal as science educators and our belief that young people and professional scientists can have a mutually beneficial affiliation in the context of field-studies. The scientists provide the students with an opportunity to experience methodology and to participate actively in field-research. The students, as educated volunteers, provide a cheap and efficient means for data-collection. A societal benefit from this association is, of course, a group of young people maturing into educated and experienced decision-makers.

Over the past four summers, we have introduced 100+ young people (ages 12-19) to intensive field-research in the eastern U.S. and in Ecuador. Our sites have included wilderness areas in the Appalachian Mountains, the Potomac River and Chesapeake Bay, the Atlantic shoreline, cypress swamps, the Galapagos Islands, areas adjacent to Andean glaciers, and the cloud forests of Ecuador. These young people have demonstrated time and again their competency in data-collection--given proper direction and time for development. The compiled results of their field-research have been used not only in class discussions but have even passed into the hands of local and international park authorities.

Programs emphasizing field-techniques can be developed within existing school curricula and as summer enrichment. In both cases, emphasis should be placed on overall understanding of ecological principles. Each spring the Eighth Grade at Langley School (McLean, Virginia) spends four days on Assateague Island off the coast of Virginia studying barrier-island ecosystems. Our sites have been visited for four consecutive years. Students measure changes in saltmarsh and dune deposition, tidal currents, plant succession, water quality, and animal distribution. These data are given to the park and wildlife management researchers who have ongoing studies at the same sites. The fourth day is spent offshore, looking for marine mammals and pelagic birds. The students also collect plankton that is brought back to the classroom for identification. The trip is meant to immerse the students totally in field-work, starting with dawn bird-hikes and ending with night-sky observations.

Our summer field-studies program complements the regular curriculum. Time is spent in the classroom training the students in specific field-methods and presenting an overview of the project. Focus is placed on specific tasks, so that students will become competent at collecting particular data. Each year the projects change as research opportunities develop. For instance, a beaver study was conducted during one summer. Four areas along the Potomac watershed were surveyed. Class preparation included field-techniques as well as background on the natural history of the beaver. By dissecting a roadkill, the students gained intimate knowledge of the key anatomical adaptations of this animal. The study measured dam length and width, diameter of sticks used in dam and lodge construction, water quality and depth of the pond, and locations of channels and food caches. The course lasted one month, with one week in class and several days and nights at each site.

We intentionally leave room daily in our programs for relaxation, personal reading, exploration, and journal writing. The students seem to gain more from the living laboratory when there is an avenue for play and camaraderie. They are strongly encouraged to keep a journal and record field-notes complete with sketches. Basic outdoor skills such as orienteering and backpacking are also learned. Students are responsible for meals and field-equipment. They carry everything into the study site. This responsibility generates a strong sense of community and an increased self-confidence.

In 1985, another program focused on the Galapagos Islands and mainland Ecuador. A six-month preparatory course included discussions on organic evolution, animal behavior, geology, and tropical ecosystems. The Charles Darwin Research Station and the Galapagos National Park Service had suggested three projects for which funding was not available. These included nest censuses, oceanographic data-collection, and the gathering of water and plankton samples. The students voluntarily collected the data and organized them for presentation to the scientists.

The value of this type of work is twofold. First, the students gain experience in field-work and learn a tremendous amount about the environment and themselves. Second, the scientists gain reliable data that due to time or funding constraints would not be available otherwise. The interaction between young people and scientists also generates a broader understanding of the natural world and the role of each individual in maintaining the quality of the environment.

The establishment of an active field-research program can be viewed from three perspectives: that of the educators, the naturalists, and the administrators. Educators are encouraged to utilize nearby natural areas as "living laboratories." These are generally open niches for basic student research, since very little technical work can conform to the legal constraints on such areas. This approach will help students become familiar with their locale and understand the available natural resources that immediately affect them. Contacts can be made in parks, wilderness areas, museums, research labs, specific-interest sites (e.g., nuclear reactors) and support-facilities (e.g., campgrounds and property owners). Careful consideration also has to be given to the equipment inventory and development of a bibliography. Working in conjunction with on-going research can often mean that expensive equipment can be borrowed. Equipment should not be the limiting factor or the sole basis for any science program.

Naturalists, on the other hand, have a transient and broad audience and have a specific site from which to work. The establishment of special projects for students and conformity to community activities are important considerations. Administrators should consider field-research in the context of the entire educational program. Individual research projects can involve multiple disciplines. The projects should not always be random spurts of creativity but should more often evolve within the framework of a pre-established curriculum with definite goals. This involves several years for development, with the first year being the toughest. Instructors have to be given ample opportunity to expand and to investigate similar programs. Finally, the administrator is not just limited to funds available within his or her own institution. Necessary financial support can come from local corporate sponsors and private donors when they are aware of firm needs and commitments to particular projects.

Natural areas are ready-made resources for educational programs that stress field-studies. They are living laboratories where pre-college students can work in conjunction with the professional scientific community as efficient data-collectors. Not only can students quickly gain basic knowledge about local flora and fauna, but they can become responsible and informed citizens through such invaluable training. In the field of observation, they will have the best-prepared and most sensitive minds.

VII. M. The Resource Inventory as an Instructional Device

John F. Disinger and Marylin Lisowski, The Ohio State University.

Any definition of "environment" precludes mono-disciplinary connotation. The environmental educator faces the continuing necessity of delimiting his/her area of concern so that it is manageable and purposeful for both teaching and learning. It is fashionable and comfortable to say, as many have, that "environmental education" is a process rather than a body of knowledge, and this is true to the extent that any "....education" is a process geared toward dealing with knowledge in some content area or combination of areas. From such a perspective, environmental education can be defined as a process focused on knowledge about the environment.

The content focus of environmental education can, and perhaps should, be viewed as the examination, understanding, and application of knowledge of the processes, biophysical and sociocultural, inherent in environmental relationships. Thus, "process" is a focus of environmental education in another context. The environmental processes of concern are clearly multi- and/or inter-disciplinary, as are the educational processes most effectively employed in teaching and learning about them. But then, who said that it was going to be easy?

This paper deals with a college/university environmental studies activity which seeks to employ learning processes in such a manner as to promote holistic learning about environmental processes in a real-world context. It is offered here as a "This is how we do it" description, in the hope that it may be adaptable by, or at least of interest to, others with similar instructional and learning objectives.

Since 1975 the School of Natural Resources of The Ohio State University has offered, not more than once a year, an elective course entitled Watershed Resource Evaluation. The senior author of this paper has served as the instructor for all offerings; the junior author was a participant in one of them. The course was originally designed as a "second course" in Natural Resources Management Interactions, complementing another offering focused on environmental impact assessment. The first time around, the new course's clientele was entirely students who had just one academic quarter previously completed the first one and had requested a follow-up opportunity. Since that time, enrollees have either completed the first course or have otherwise demonstrated sufficient background in related fields to predict their competence in dealing with the concerns of the new course.

Procedures utilized have remained relatively constant over time. A small (50 miles^2 to 400 miles^2) nearby watershed, or similar defined area, is identified, and a detailed investigation of the area's resource base is performed. Study areas are selected on the combined bases of typicality and convenience, not on the bases of pre-identified major problems demanding immediate attention. The presence of both urban and rural aspects is considered important.

Participants work in small interactive teams to inventory the area's resource base, investigate its history in terms of resource use and management, determine current trends, project future resource use based on those trends, and develop recommendations relative to the desirability of continuation, or change, in policies and activities dealing with resource use. As will be noted from Appendix I, "resource base" is defined broadly; it is neither restricted to the typical, traditional concerns of natural resources management, nor to the identification and consideration of socio-economic-cultural resources, but attempts to blend all resource-related concerns. Thus, the interfaces and interactions between and among all resources are the desired foci; process is at the heart of the matter.

The first step is necessarily the inventory: what is there and why, how did it come to be that way, how is it used and/or managed? It is critical, but not easy, to consider these questions first, before considering possible uses and management techniques.

The parameters identified in Appendix I are an attempt to be exhaustive, and to provide a practical template for identification of all possible areas demanding consideration. The original list of parameters was derived from Leopold's environmental impact assessment matrix (1971), as modified in a listing published by Anderson and Breton (1976), and further modified by the thoughtful consideration of a decade of student participants attempting to deal with the realities of "their watershed." Not all parameters are pertinent to all watersheds, but students are expected to justify non-inclusion. Depending on the particular situation, some are "more important" than others, but no assumptions of importance or lack of it are acceptable without documentation.

Because the course is not a requirement of any curriculum, enrollments are generally small; class size has ranged from ten to twenty. Because it is advertised campus-wide, it attracts a diverse clientele. Generally, half the enrollees are majors in a natural resources management curriculum, while the other half may be made up of students from Agronomy, Biological Sciences, City and Regional Planning, Education, Engineering, Geography, Geology, Public Administration, or elsewhere. Most are at the Master's level. There are some undergraduate enrollees, mostly in natural resources management curricula, and infrequent participants from doctoral programs in other areas.

Course management presents interesting considerations. As noted above, all inventory areas are investigated by teams of students, using resource materials ranging from texts and general references through agency and consultant reports, statistical summaries, theses and dissertations, and many interviews. Rarely are field-level investigations conducted; there is not enough time, and most of the needed information has been reported by someone, somewhere, for some purpose. Opportunities for intra-team and inter-term learning are omnipresent, as participants progress from individual investigation of discrete parameters to attempts to represent intelligently what they have discovered into a single, comprehensive, cohesive, balanced report.

Merging the inventories is challenging, particularly because that synthesis is strictly a task of the participants, with minimal instructor input. Individuals find it difficult to accept abridgement of their own contributions, but there is always too much information, and some of it must finally be judged more pertinent than some of the rest. The processes of identifying what must be included, how it is reported, and what is extraneous or of less import, is a critical part of the exercise.

Nonetheless, with concise inventory information finally agreed upon, due attention to historical considerations, and intelligent identification of trends, all of which represent the normal output of this course, participants still find that reaching consensus regarding recommendations--what should be, and will be, if managed in a purposive manner--is difficult. At this point they are most likely to challenge the values, stated or implied, of their classmates; some are budding Muirs, while other follow the Pinchot tradition. After an academic quarter of intense cooperative effort, participants are unlikely to disregard challenges to their own value systems. Rather, they reach consensus, sometimes uncomfortable, somewhere near the middle. Perhaps this is because, though their values may be different, all are in the final analysis operating from a common information base, and each has some understanding as to where the others are coming from.

REFERENCES

Anderson, Anthony H., and Jack D. Brenton. 1976. The Preparation and Review of Environmental Impact Statements. Washington, DC: U.S. Environmental Protection Agency, Office of Water Programs, Contract No. T-900517-01-0.

Leopold, Luna B., Frank E. Clarke, Bruce B. Hanshaw, and James R. Balsey. 1971. *A Procedure for Evaluating Environmental Impact*. Washington, DC: U.S. Department of the Interior, Geological Survey Circular 745.

APPENDIX I: ENVIRONMENTAL INVENTORIES

An environmental inventory is a value-free summary of the existing characteristics of a specific, defined location. It should be completed without consideration of potential or proposed developmental activities; i.e., it should represent the location as it exists at the current moment in time.

TOPOGRAPHY

1. Elevations
2. Total relief
3. Slope characteristics
4. Dominant landforms
5. Land-sculpturing agents
6. Manmade changes in topography

GEOLOGY AND SOILS

1. Geologic formations-composition and bedrock stability
2. Geologic formations-mineral deposits
3. Crustal movements (faulting)
4. Soil classification and composition
5. Soil characteristics (permeability, compactability)
6. Soil stability

HYDROLOGY

1. Running surface water
2. Ponded surface water
3. Ground water
4. Domestic water supply

WATER QUALITY

1. Contaminants
2. Water temperature levels
3. Aesthetic qualities
4. Dissolved oxygen levels
5. Sources of water contamination
6. BOD effect from contaminants
7. Special problems

REGIONAL CLIMATE

1. Temperature
2. Precipitation
3. Humidity
4. Wind patterns and conditions
5. Stability conditions
6. Inversion probabilities

AIR QUALITY

1. Airshed
2. Existing ambient air quality
3. Circulation system of airshed
4. Contaminant sources
5. Contaminants
6. Contaminant effects in relation to air supply standards
7. Aesthetic qualities
8. Potential adverse health conditions
9. Special problems

NOISE POLLUTION

1. Existing ambient noise quality
2. Effects upon residential areas, schools, hospitals, rest homes and their residents, employees, and users
3. Effects upon commercial and industrial areas, their employees and users
4. Effects upon agricultural and recreational areas, the employees, users, and resident wildlife
5. Established and/or proposed noise standards and guidelines
6. Health standards and parameters
7. Special problems and community concerns

FLORA

1. Types
2. Habitats
3. Ecological role
4. Conditions or elements that influence
5. Unique, rare, and endangered species
6. Aquatic and terrestrial vegetation

FAUNA

1. Types
2. Habitats
3. Ecological role
4. Conditions or elements that influence
5. Unique, rare, and endangered species
6. Migration and breeding habits

LAND USE

1. Types
2. Densities
3. Area and specific plans
4. Special problems

DEMOGRAPHIC CHARACTERISTICS

1. Population characteristics
2. Location
3. Employment patterns
4. Migration patterns
5. Growth rates and patterns
6. Housing types

TRANSPORTATION AND TRAFFIC CONGESTION

1. Traffic generators (origins and destinations)
2. Transportation routes
3. Modes of transportation
4. Volumes of flow and variations
5. Areas and causes of congestion
6. Traffic control systems
7. Special problems

UTILITIES AND PUBLIC SERVICES

1. Water
2. Sewer
3. Electricity
4. Telephone
5. Fuel
6. Police
7. Fire
8. Schools
9. Hospitals
10. Governmental operation centers
11. Irrigation and other special services

ECONOMIC CHARACTERISTICS

1. General area economic characteristics
2. Area tax base
3. Area per capita income
4. Area cost-of-living index

HISTORIC, PREHISTORIC AND ARCHAEOLOGICAL FEATURES

1. Location
2. Uniqueness or rarity
3. Cultural and/or educational value
4. Facilities and/or techniques for preservation
5. Vandalism
6. Special problems

AESTHETICS

1. Visual aspects of structures (view corridors, bulk, shapes, color, design, light, and shadow patterns)
2. Odors and visual aspects of air quality
3. Noise
4. Visual aspects of water quality
5. Landforms
6. Flora and fauna
7. Historic, prehistoric, and archaeological features

VII. N. From Marsh to Dune: An Extended Field Experience

Donna Dockery and Linda Lew, Richmond Community High School, Richmond, Virginia

A 20-minute color video tape of Richmond Community High School students engaged in field study on the Barrier Islands of Virginia provided the focus of this presentation. Richmond Community High School is a public, alternative high school for academically gifted students.

VII. O. Wildlife Puppets: An On-Hands Approach to Nature

Edward H. Falco, "Nature and People," Danville, PA

Wildlife puppets present a special educational opportunity that warms the heart and stirs the mind. Puppet "magic" kindles memories, emphasizes important lessons, and brings joy to all ages.

Puppets can portray animal or human behaviors. They can be sad, silly, sensitive, wise, ignorant or bad, without either the puppets nor the puppeteer losing credibility. Puppets are an extension of one's own self. They attain the feelings, thoughts, and beliefs of their handler and trainer. Puppetry opens up channels of communication (where none might have existed before) between the educator and the learner through self-expressions and group interactions.

Wildlife puppets offer a fresh and innovative approach to environmental learning through storytelling, drama, plays, book talks, nature hikes and imagination. Puppets provide an attractive and workable means to stimulate interests in specific subject matter and to encourage self-motivation, positive attitudes, and free expression of feelings and ideas.

Effective puppetry requires fine, small and large motor movements. They combine finger, hand, wrist and whole-arm pantomime techniques. Puppetry is quickly becoming an accepted, important mental and physical rehabilitation tool. Wildlife puppets can only "come alive" by deriving life and personality from the puppeteer. It does require a special feeling, some imagination, and a little practice time to perfect. But that is something every one of us can supply.

Introduction to an "On-Hands" Experience

There are always main ingredients needed to make any experience worthwhile. The following is my recipe for serving up a provocative and educational wildlife puppetry meal:

-1 or more puppeteers, lightly seasoned (never hard-boiled)
-2 cups creativity
-1 pinch of resourcefulness
-4 lbs. perseverance
-2 shakes of enthusiasm
-1 package of original and realistic wildlife puppets

Pre-heat puppeteers and realistic wildlife puppets before mixing and spreading them over a "buttered-up" audience. Tenderize your talk. Share from the heart accurate facts and concepts from the head. Add spice when needed. Serve piping hot. Don't let subject matter sit for very long, otherwise it becomes stale. Serves 1 to infinity.

Knowing your objectives and sharing them with your supervisor and administrator will gather you support for your puppetry project. Below is a list of questions you should ask yourself before presenting your ideas:

1. Can I meet management's goals through puppetry?

2. How much time will it take?

3. Why am I doing it?

4. Who is the target audience?

5. What am I going to present? (themes, nature awareness, etc.)

6. How will I present it? (stages, puppets, props, etc.)

7. Where will I present it? (good acoustics is a must)

8. How many staff or volunteers will I need, if any?

Also, it might be a good idea to have answers for limiting factors such as: 1) budget considerations (puppets are generally a very low-cost item), 2) facilities (space and location), 3) transportation and storage, 4) audio visual equipment if needed, 5) availability of materials, and 6) personnel requirements. You can't go wrong with advanced preparation.

Wildlife Puppets

As you may already be aware, there is really little literature being produced on wildlife puppets and the techniques for making them "come alive!" Hopefully, I can offer some suggestions and advice that six years of trail-and-error experience have manufactured.

Mouth puppets vs. Hand puppets: Personally, I feel hand puppets are the most effective. Hand puppets have no moveable mouth, per se, but have moveable hands and heads. Mouth puppets have moving mouths, but not hands. Here are my reasons for preferring hand puppets:

1. "hands or paws" are probably the most valuable non-verbal communication instrument. Think how much you use your hands when talking.
2. emotions, reactions, instructions and self-concepts are shown and demonstrated much easier using "hands or paws"
3. in conversation, how often do you watch a person's mouth open and close (unless you're a dentist)?
4. with practice, proper head movements make hand puppets seem like they have a mouth and are "talking".

Puppets should have large, realistic eyes and distinct features which make them unique and life-like. To capture attention, the critter should be furry and touchable. Use natural fur colors. I prefer using mainly native wildlife and farm animals, but exotics can add diversity to a story line or plot.

Presentation Techniques

Puppet Talk, Yes or No? Either way can be effective and has certain advantages. Your decision depends on your objectives and the puppeteer's personality and willingness to "do it for the cause," without sacrificing quality.

Silent puppets give the puppeteer less to concentrate on because he or she is communicating with the audience as though it were a live animal demonstration. Talking puppets require a two-way conversation between one person and possibly the entire audience. People who regularly talk to themselves should be naturals.

Every one of my puppets has its own personality and traits. Even their speech reflects a feeling, behavior pattern, or location. Each animal has its own special, heart-warming name. If you make your creature "talk," enunciation and volume are extremely important. Try practicing some speech exercises with your critter. Try something like this: the skunk sat on a stump and thunk the stump stunk; but the stump thunk the skunk stunk; the skunk stunk! Don't be afraid to try. Remember, your credibility as an educator and adult will remain intact. The puppet literally shoulders all the burden, for both failure and success.

Puppet Movements or How to Make a Puppet "come alive!" This is the most crucial ingredient of any puppet presentation. Many have failed to deliver an otherwise great story and message because of "dead" puppets. A staff training workshop would prove very beneficial here. When that puppet is on your hand, this is where your feelings, ideas and actions are accentuated and emphasized. Natural movements make your animal "come alive," not words.

Space and time do not permit me to give you most of the necessary meat for puppet movement. However, here are a few helpful tidbits. First, study the animal specie(s) you intend to use or portray. Learn any peculiar habits or movements. Practice in front of a mirror. There are three basic movement patterns in puppetry: finger, wrist and whole-arm. Puppet movement is really specialized pantomime. Because puppetry requires both physical and cognitive activities, puppetry offers limitless possibilities for therapeutic use. For example, a patient recovering from a stroke, instead of squeezing a rubber ball, can exercise with a hand puppet. This also involves large, small and fine motor exercises, along with mental stimulation. Who can argue that a furry, likeable puppet is more pleasurable therapy than a hard rubber ball?

Some examples of certain movements include: waving, crying, clapping, walking, picking-up, skating, thinking, etc., all of which require very specific movement techniques. My best advice to you is think like the animal!

Live or Tape? For first-timers I recommend a taped performance if it is longer than 10 minutes. Taping allows you the freedom to concentrate on movement patterns without worrying about misreading lines, getting lost in the script, etc. Plus, you can record the show exactly as you want it. There are potential drawbacks, however. With a taped show, you tend to lose vitality, spontaneous response and possibly sound effect, depending on the acoustics of your building and quality of your taping equipment. Audiences must be able to hear clearly and differentiate between your critters' voices to follow your story.

Live performances add that special touch and realism to your presentations. I feel it makes your content much more believable. You can become more personable with your audience and take advantage of "teachable moments." But it does require both talking and acting at the same time.

Last Minute Details. Starting out, I would suggest using a stage to hide behind, unless you feel rather comfortable standing in front of an audience. I believe, through experience, that merely standing in front of an audience with one creature at a time on your hand is just as effective, if not more so (you can watch the audience and respond to them). Practice and experimenting will lead to a polished performance.

Enhance your show with poems, songs and legends, but keep it short. Any puppet show over 30 minutes, no matter how good, will go stale. Involve your audience as mush as possible. Relate personal experiences appropriate for the age level. Keep it simple and sincere. Place a monitor in the audience to give you positive or negative feedback or cues. Don't be afraid to involve as many people as you can into a presentation. Two heads are better than one, they say.

Now you are ready for the curtain to rise. Good Luck!

Conclusion

Wildlife puppetry is an exciting, stimulating, and effective "on-hands" tool for sharing nature and the environment with all ages. Puppet "magic" comes only from the heart with information stored in the head. Puppetry is very useful with patients undergoing rehabilitative treatment and children who are shy or introverted. Expenses are generally very low, while rewards are extremely high. Any educator can use puppetry to increase awareness and understanding of our environment.

Patience, perseverance, practice, and love of people are all essential elements for conducting a quality performance. Realistic-looking puppets with large eyes and furry touchable bodies are very attractive qualities. But remember, probably the single most important point is to make the puppet "come alive" with a special feeling and a believable personality so that critter can be whoever or whatever you want it to be.

Share the earth and a wildlife puppet with someone special; you'll be glad you did.

VII. P. Using Ongoing Studies in Teaching Ecology to Secondary Students

James V. Feliciani, Land O'Lakes High School, Land O'Lakes, Florida.

Introduction

In today's world, students must possess a respect for their environment, a respect which comes primarily from understanding. In order to better understand the environment, students must become involved with it. Although this does not necessarily mean having to actually participate in the system, students can become involved mentally by observing, and that is a critical scientific skill.

Observation is the foundation to finding the order in natural systems and from observation comes the generation of basic principles, the cycles which occur in nature. When students familiarize themselves with these cycles, they are then able to make sound predictions concerning the future, and this is the essence of environmental education.

Ongoing (Longterm) Studies

Ongoing studies are well-suited for finding patterns or cycles in nature. These studies are continuous measurements or investigations of one particular environmental concept at a time. Measuring the level of dissolved oxygen in a pond from one month to another is an example. Over the course of several years, predictions of these levels could be easily made.

Benefits from Conducting Ongoing Studies

The benefits gained from conducting continuous studies are too numerous to review, but several are worthy of mention here. Foremost in importance is the development of a student's ability to discover cycling in nature--the predictable repetition of events or values in the environment.

Students will also have the opportunity to familiarize themselves with environmental concepts gradually, allowing for better long-term memory and less "jargon shock." Students work their way through a concept in a more relaxed atmosphere, having several opportunities to observe the same situation from different angles. The result--better comprehension and retention of the concept.

Students gain insight into actual investigations currently being reported in newspapers, magazines, and other publications. They gain an appreciation for the "length" of a study which may yield more valid observations. In addition, they learn the value of patience and persistence in scientific investigation.

While developing ongoing studies, students become adept at scientific methodology. They learn that there are no "quick fixes" to ecological problems and become aware of the limitations and complexity of science.

Suggested Topics of Study

Several topics that are commonly discussed in lecture format exclusively are very appropriate as topics for ongoing studies. Several examples are discussed below.

Periodicity of abiotic factors. The periodicity of events, especially annual changes, are easily observed and suitable as ongoing studies. Abiotic environmental factors involving water chemistry, light intensity, temperature, humidity, and precipitation are just a few of numerous factors that can be studied, graphed, and predicted. They are also the easiest to obtain.

Animal cycles and patterns. Included within this realm of scientific study might be such topics as animal migrations, nesting cycles, feeding habits, etc. Easy and interesting studies might involve observing how spiders position their webs next to others or how and where ant lions build their pits.

Succession. Succession can be a very subtle process to observe and the changes difficult to see during the course of a school year. However, with the correct strategy and timing, secondary succession can be easily demonstrated. One way to set up a succession investigation is to locate a small patch of ground anywhere on campus and have the students remove all plant life. If done at the beginning of the school year, the regrowth can be observed for the remainder of the year. Remember, the more time the students spend observing, the better their awareness of the changes that are occurring.

Effects of management by man. If you can obtain an appropriate area on campus, a worthy project is the establishment of controlled burn plots. Set up two or three of identical size and same approximate location and burn each one on a different cycle; every year, two years, and so on. Students have the opportunity to study the regrowth of each burn cycle and have actual specimens to collect or chart.

Repetition of previous studies. Choosing any topic, repeat the same study from year to year. Take all recent observations, measurements, samples, etc. and add them to those of previous years. This annually updated file can be used with the new set of students coming into the course each year. Careful planning by the instructor is the key to successful continuous studies, whether topics are original one year studies or repetitions of previous studies.

How to Conduct Ongoing Studies

Organization and Topic Selection. You must be organized before you ever begin. Select just one environmental factor or situation for your study (to begin with) and prepare to study this idea for the entire school year. When you become accustomed to this type of study, increase the number of factors you wish to observe.

Location. With the average science class running fifty minutes in length, it is very difficult to leave the immediate vicinity of the school without taking field trips. A typical long-term study should be conducted over several class periods, and not just occasional field trips.

The best location in which to conduct any outdoor study is right on your own campus. If the opportunity exists to set up your own ecological study area, do so. Use a small body of water, a small patch of land, or even the entire campus as your "lab" site. Also remember that travel time between and during classes must be accommodated.

Attitude. Two mindsets need to be dealt with here--that of the instructor, and that of the class. Before introducing any long-term commitment which will be attempted by the instructor and the class, the instructor should be certain about the fulfillment of the ongoing study from start to finish. This will largely determine the degree of success in the project.

The typical science investigation lasts for no more than one or two class periods. Students get used to this situation and quickly develop a reluctance to repeat any investigation more than once. Students must be taught to realize that a major goal in performing an ongoing study is to determine or discover a pattern, cycle, or simply some change that is taking place. The only way to determine whether or not a change took place is by repeating the same measurement again and again. The certainty of one's findings improves with an increase in the number of repeated measurements.

Time-budgeting for lesson plans. Time-budgeting means allowing extra class time to discuss ongoing studies. Time-budgeting is best described by this example:

> Suppose that two times a month you take your class outside to make observations of a pre-selected factor; that is one day during every other week. During the alternate weeks you should spend one class period discussing your results in order to maintain continuity. That is four days a month or approximately thirty-six days per school year which must be accommodated into your lesson plans. This is not an unreasonable amount of time for an ecology or environmental science class to spend on ongoing studies that teach major environmental concepts.

Conclusion

Ecology should not be taught to students as a typical biology class, with an emphasis on specifics and a good deal of jargon shock. Instead, it should be observations of the way one concept interreacts with another. Eventually, the interreactions include more and more concepts until the whole scheme can be realized.

The investigations in an ecology course should blend in the same type of manner. Hence, the answers produced in one investigation should blend into those produced during the next. This is easily accomplished with the practice of ongoing or long-term studies.

To promote an environmental attitude or awareness, more emphasis needs to be placed on long-term projects as ecological teaching tools. Students gain a necessary respect for well thought out studies and learn to be critical of research. Meanwhile, ongoing studies allow students to stay involved, and in doing so, learn that ecology is a philosophy to carry throughout one's life.

VII. Q. The Community-Sponsored Natural Science Center: A Vital Key to Our Sustainable Future

John Ripley Forbes, Natural Science for Youth Foundation, New Canaan, Connecticut.

The role of the community-based natural science center as a basic and vital tool for conservation education was presented. Why school-sponsored nature centers often fail was discussed. Our sustainable future depends in large measure on our ability to better educate our future generation, and the natural science center may well be a key to our success.

VII. R. The Environmental Education Curriculum Inventory-A Curriculum Aid for Teachers

Ron Gardella, Northern Kentucky University, Highland Heights.

The Environmental Education Curriculum Inventory Workshop provided a description of a recently developed instrument designed for practicing teachers to use when developing environmental education curriculum.

VII. S. Developing Programs for On-Site Materials and Resources for Outdoor Residential Programs
Kathleen M. Geigel, Environmental Consultant, Portersville, Pennsylvania.

Are you looking for new, interesting ideas for programming? Do you find your budget does not always allow the new materials you would like for new programs? What if you found that you had the resources and materials you needed right on your own school site or camp facility? This workshop was designed for the participant to learn through simulations, the survey technique of on-site resources, and the designing of programs from these resources suitable to their school's or camp's needs.

VII. T. A Challenge to Environmental Educators
Richard Golden, New Rochelle Schools, New Rochelle, New York.

The goal of a sustainable future can only be reached when a majority of citizens make ecologically sound decisions based on value systems that are based on an understanding of environmental principles. The new New York State elementary science syllabus addresses this need by including a science attitude component in addition to science content and process skills. One of the attitude goals is to help students to act "in ways which enhance the quality of life for one's self and others." This workshop examined the educational goals of the new syllabus and showed how some of them are being met by student-centered activities. Lesson plans were made available.

VII. U. ECO-ACT - Education for Environmental Leadership
Karla Goodman, Missouri Botanical Garden, St. Louis.

The ECO-ACT Environmental Leadership Program disseminates ecological and environmental concepts at St. Louis area schools by training high school students to teach elementary school children. Disadvantaged and privileged students learn to work together toward a sustainable future. Part I: Ways to adapt and implement the ECO-ACT model. Part II: How can we change old messages to new ones about science, society, and the self?

VII. V. National Wildlife Federation Conservation Education Programs

Jack Greene, Craig Tufts, Betty Olivolo, and Judy Braus, National Wildlife Federation, Washington, D.C.

This presentation was an overview of four major National Wildlife Federation conservation education efforts; each was presented by the program head. The programs are: The CLASS Project, a set of investigations to enhance science and social studies curricula for middle/junior high schools (Jack Greene); The Backyard Wildlife Habitat Program, landscaping property to provide habitat for wildlife (Craig Tufts); National Wildlife Week, a national conservation program celebrated during the first week of Spring (Betty Olivolo); Nature Scope, a science activity series, five issues per year, for elementary school teachers (Judy Braus).

VII. W. Groundwater: A Vital Resource

Lynn M. Hodges, Donna A. Lifur, Anne E. Lyon, and Carla L. Taylor, Tennessee Valley Authority.

In the seven-state, 201-county Tennessee Valley Region, there are six major aquifer areas. Approximately one-half of the region, because of natural geohydrological conditions, has deficient groundwater availability. Over-pumpage of groundwater is occurring at several locations in the central and western portions of the region. More than 64 percent of the region's residents rely totally or in part on groundwater for potable drinking water. For every public surface water supply system, there are three public groundwater systems. Groundwater is utilized by nearly 3700 community water systems, businesses, industries, hospitals, churches, campgrounds, and schools.

This dependency on groundwater makes contamination a major concern. Contamination has been documented in the region from improper waste disposal, mining activities, oil and gas exploration, agricultural activities, septic tanks, industrial disposal activities, and general urbanization impacts. Serious degradation has required closure of well and spring supplies in some areas. Toxic compounds have been found in the groundwater at several locations. The single most prevalent drinking water quality problem remains bacteriological contamination.

In general, current groundwater quality is believed by most experts to be adequate to support existing water supply uses, although some minimal treatment, such as chlorination, might be recommended. Equally evident is the fact that a polluted aquifer is virtually impossible to clean. Prevention of contamination, therefore, becomes a priority objective.

Contributing to this objective is increasing the public's awareness and knowledge through a general water quality education program. This program will support the development of regional groundwater quality protection plans and will facilitate their implementation.

The Tennessee Valley Authority's (TVA) Environmental/Energy Education Program and Water Quality Branch, in cooperation with regional educators, has produced the initial piece of the educational program. *Groundwater: A Vital Resource, Student Activities* is a collection of teaching activities designed to expand awareness and knowledge of groundwater. Factsheets are being developed to address five specific issues about groundwater protection in the Tennessee Valley, and will be distributed to the general public.

Partnerships

The initial focus on the groundwater education program was the upper east Tennessee Region. This region was the site of an on-going demonstration project on groundwater assessment and protection. Interest was expressed by TVA, the First Tennessee Development District, Cedar Creek Learning Center, and the Tennessee Eastman Company. This partnership among federal, state, local, and corporate interests provided a foundation upon which a joint training and writing workshop was held. Educators from throughout the region participated. Formal presentations from water quality experts, industry control specialists, and water quality protection advocates provided a knowledge base. Field explorations, intensive case studies, and hands-on practice with monitoring equipment provided the experience base. Building on the workshop experiences, the participants developed teaching activities to groundwater. The result was a compilation of 23 teaching activities for schools and citizen groups.

Contents

Contents of the "Groundwater: A Vital Resource, Student Activities" booklet are as follows:

Activity No.	Activities	Level
	THE WATER CYCLE	
1	Characteristics of an Aquatic Environment	Grades 4-12
2	Nature's Waterwheel	Grades 4-6
3	Study of a Spring or Stream	Grades 4-12
	WATER DISTRIBUTION IN SOILS	
4	Calculating Water Table Depth	Grades 9-12
5	How Different Soils Affect the Movement of Water	Grades 3-9
6	Illustrating the Water Table	Grade 4-8
7	Porosity and Permeability	Grades 7-12
8	Purifying Water by Filtering	Grades 3-5
9	The Invisible Load	Grades 8-12
10	Wells and Groundwater	Grades 5-9
	WATER QUALITY	
11	Acid Rain-How Acid is It?	Grades 7-12
12	Carbon Dioxide in Water	Grades 9-12
13	Coliform Bacteria Determination	Grades 9-12
14	Does Acid Rain Affect Groundwater?	Grades 8-12
15	Making Acid Rain	Grades 4-8
16	Nitrates in Groundwater	Grades 7-12
17	Total Suspended Soils	Grades 9-12
18	Farmers and Water Pollution	Grades 9-12
19	Groundwater Rights	Grades 5-12
20	How Does a Settling Tank Work?	Grades 4-8
21	Municipal Waste Contamination of Groundwater	Grades 5-12
22	Polluted Ponds Lead to Polluted Groundwater	Grades 4-6
23	Pollution of Groundwater	Grades 9-12

Titles of the Groundwater Fact Sheets include:

- What is Groundwater?
- Protecting a Homeowner's Well Supply
- Agencies Concerned With Groundwater
- Mining and Petroleum Exploration and Groundwater
- Agricultural Activities and Groundwater
- Waterborne Disease and Groundwater.

Distribution

The final editing and printing of the "Groundwater" A Vital Resources, Student Activities" will be completed by October 1, 1985. The activities will be distributed to schools throughout the 201 counties in the Tennessee River Valley through workshops conducted by a network of University-based Centers for Environmental and Energy Education.

Factsheets will be distributed to the general public in conjunction with seminars, and upon request to TVA's Citizen Action Line. A limited number will be distributed by TVA and cooperating groups.

VII. X. Educating the Up-Coming Generation: Denver Audubon Society's Urban Education Project

Karen S. Hollweg, Denver Audubon Society

Teachers, parents, and others who have watched children will tell you that children who grow up in natural settings and/or have opportunities to get to know nature directly through recreational experiences become adults who understand the ecological relationships on which all life depends and care about environmental issues. This "common sense" correlation was documented by Tanner (1979), who surveyed the leaders of national citizen conservation groups. 44 of the 45 conservation leaders cited "positive youthful experience in the out-of-doors and relatively pristine environments" as the "predominant influence" in shaping their informed, active involvement in environmental issues as adults.

Developmental psychologists, most notably Piaget, and science educators have emphasized for 15 to 20 years that children need direct, concrete experiences--acting on and manipulating objects--as the basis for intellectual development. Direct experiences with living things in the out-of-doors--not watching movies, reading about wildlife, or playing simulation games--form the basis for understanding the natural world (Sund, 1976).

Unfortunately, a vast majority of today's youth don't have access to the natural environment and/or first-hand experiences that will allow them to get to know and care about nature. Pristine wilderness is too remote for most youngsters. The proverbial "pond on the back 40" or the undeveloped gulch down the road, where children used to spend Saturday morning and summer days catching frogs or chasing butterflies, are lacking in most urban neighborhoods. The less obvious aspects of nature which exist even in our core-city built environments go largely unnoticed. Children are frequently unaware of the plants and animals living in their immediate surroundings.

In the 60s and 70s, science educators developed curricula to provide introductory, concrete experiences with plants and animals to elementary school students (e.g., nationally-funded curricula such as Science Curriculum Improvement Study, SCIS). But Stake and Easley (1978) found that public schools appeared "to be moving away from science education" and that "reading about science" was frequently considered as science instruction in elementary schools. And in 1983, the National Science Board Commission implied that the non-formal sector should take on the responsibility of providing youngsters with first-hand experiences in the natural world:

> Children have had little guided experience with physical and biological phenomena that are all around them.... Formal education must be supplemented by a wide range of activities that can reinforce the lessons of the classroom and lend meaning and relevance to the rigor and discipline of formal study.

Meeting the Challenge

Also in 1983, without knowledge of the Commission's views, the Denver Audubon Society (DAS) Board of Directors committed itself to a major effort aimed at the education of Denver's youth. The Board's basic concept was to "teach children by teaching adults" in a program "without walls." Such a program would tap Denver Audubon's richest resources: its 2500 members and the good name of the Audubon Society. With funds raised to support the first year, the program's development began in August 1984 with the hiring of an Education Project Director. This paper explains the development process we've used and thereby also defines the program's objectives and structure, and tells how we've gained support and participation of many members, children, corporations and foundations in our first year.

Needs Assessment

Our intuition told us that there was a real need to provide Denver children with positive experiences that would enable them to become aware of and investigate living things in their natural surroundings. But the wisdom of the DAS Board and the Education Committee led us to assess the need, identify programs that already existed, define a curriculum that would be valuable for the children, determine the marketability of the program, and target our audience(s). This was an essential beginning step, because it provided us the data necessary to build a strong rationale, which helped in recruiting volunteers and participants, and in raising additional funds to sustain our efforts. The data-gathering process included:

- personal interviews with 19 science supervisors/curriculum coordinators, principals, and teachers in the seven major school districts that serve approximately 241,000 of the 262,000 students in metropolitan Denver;
- on-site observations of childrens' non-formal education programs sponsored by the city's two museums, zoo and botanical gardens, and extensive interviews with the education directors of those four facilities;
- phone and/or personal interviews with ten adults in charge of outdoor education programs at nine different public and private day camps, recreation centers, and parks in the suburbs; and
- personal interviews with 14 educators, program directors and administrators at 11 inner-city agencies/institutions where youngsters spend their non-school time (including community centers, libraries, and extended day-care centers).

In general, we found that Denver students have experiences similar to those described in the national studies and reviews. Environmental education programs have been eliminated through budget cuts, and education regarding the natural environment and ecosystems is included in "science." About half of the students are in school districts which have adopted science textbooks to wholly or largely replace activity-based curricula and which slight or ignore learning in the natural environment. The only outdoor learning most students have is a very memorable, but brief, three-to four-day experience as 5th or 6th graders in a mountain environment.

The outdoor, hands-on learning provided by non-formal institutions in the Denver-metro area are offered at suburban parks and open spaces, and at the urban zoo, botanical garden, and museums. These programs are largely available to children whose parents are in upper income levels and seek out the experiences for their children. 83 percent of those interviewed felt that more of these kinds of opportunities were needed for youngsters--especially those of middle and lower socio-economic levels.

We did *not* find informal, hands-on education concerning the natural world delivered *in the outdoor environment frequented by and accessible to children daily*--either in the suburbs or the inner-city.

Program Objectives

Given these conditions, we decided that our program must:

- reach out to children from a variety of races and socio-economic backgrounds;
- be available to them in their own neighborhoods;
- be delivered in cooperation with existing institutions and organizations;
- consist of outdoor activities that are fun as well as educational;
- depend on teams of trained volunteers supported by a minimal paid staff;
- be self-supporting in about three years.

Within this framework, we defined four learning objectives. The children participating in the program will:

- explore the natural environment in their own neighborhoods guided by adults who have a love for nature.
- gain a sense of wonder for living things.
- develop skills for observing the out-of-doors.
- become aware of their local environment, the plants and animals that live there and their interactions.

The Activities

Rather than spend extensive time, energy, and resources developing "new" learning activities, we focused our efforts from the beginning on the identification of existing activities/curricula that would: (1) provide learners with experiences directly involving (a) living organisms naturally occurring the learner's everyday environment or (b) the habitat in which those organisms live, and (2) contain clear instructions and straight-forward enough action so that they could be easily implemented by trained volunteers. To date, we have found the OBIS (Outdoor Biology Instructional Strategies) activities to be ideal.

Seven activities were pilot-tested in nine neighborhoods last spring by 27 trained volunteers. Their titles are: "Envirolopes," "Litter Critters," "Isopods," "Plant Hunt/Sunprint," "Roots and Shoots," "Animals in a Grassland," and "Ants." These activities:

- enabled 3rd through 6th graders to achieve the defined learning objectives;
- suited our volunteer-to-children ratio of 1:6;
- were activities that the children enjoyed and got involved in (as judged by the volunteers and other observers);
- were rated excellent by the staff members of the cooperating institutions ("host sites"); and
- enabled the volunteers to discover and investigate organisms and ecological relationships with the youngsters while they encouraged, listened and asked questions of the children (as evaluated by Education Committee and staff observers).

We are identifying and will try out activities for the other seasons of the year in 1985-86.

Host Sites

To date, ten institutions have hosted our volunteers. These include public schools, community centers, libraries, after school day-care facilities, and a summer day camp. By taking our program to these sites, we can enrich the host institution's curriculum and avoid spending time organizing groups of children ourselves. Another benefit is that by doing advance planning with the host site staff, we can gain insights into their children and tailor our program to their specific needs and interests.

Some of our members have time to volunteer on weekdays; others are free after work and on Saturday mornings. By working with a variety of host sites, we can link groups of children with volunteers at any of these times.

Volunteers

In our first year, the majority of our volunteers have been recruited by phone. We have used phone-a-thons to contact many members in one night, and more personal, individuals calls to speak with people who have been recommended to us. We have sought adults who possess "a desire to help kids discover the joys of nature" as well as volunteers who prefer working "behind the scenes" to make insect nets, put magnifying glasses on string necklaces, and in other ways prepare materials for the children and volunteers to use. By relying heavily on handmade equipment, we have been able to keep equipment costs to a minimum. (The total cost of instructional materials for the spring pilot test, which involved 250 children, was $810. Since then, we have identified additional cost savings).

Training workshops have been scheduled to mesh with the volunteers' free times--weekdays, Saturdays or after work. In keeping with the philosophy of the program, the three-hour workshops follow an activity-based format. The volunteers have a chance to get acquainted with each other while doing OBIS activities, becoming familiar with their roles, and discussing their questions and concerns. As the program develops, experienced volunteers will be used to train the new volunteers and take on additional leadership responsibilities (such as team leader).

In addition to training workshops, volunteers have asked for additional workshops/meetings that will allow them to compare experiences with one another and learn more about children and learning/teaching. Their motivations for participating include learning as well as having fun outdoors with youngsters.

Funding and the Future

Three factors have been key to the success of this program to date. First, by gaining sufficient financial support to hire a full-time staff member, the Board assured a solid start. It would have been difficult, or perhaps impossible, for the Education Committee members (who each have their own jobs and family responsibilities) to gather the amount of data and do the organizational work needed to initiate the project and to raise funds for subsequent years without the help of paid staff.

Second, the needs assessment gave us a sound rationale for the project which laid the groundwork for synergistic (as opposed to competitive) relationships with existing institutions in our community and for successful fundraising efforts in the public and private sectors. And finally, the sheer joy of kids discovering loads of unexpected critters in a pile of leaf litter, and thrill of finding the things that made that weird hole in the leaf, and the congenial warmth of getting your hands dirty and unraveling a mystery with a fellow nature-lover and guaranteed winners! The combination of enthusiastic adults helping small groups of kids find something new outdoors right in the kids' own neighborhood is rare and magical. There's a payoff for the kids and for the volunteers. Few corporate heads who care about their community and/or foundations concerned with the education of youth can say no to proposals for such a program.

Denver Audubon Society has raised funds to continue development of this project for the next two years. Our goal is a year-round program that involves 2500 children and 250 volunteers in neighborhood explorations. Supporters to date include four foundations, five corporations, and 126 members and friends.

R. W. Colton stated our view well when he wrote:

> Young people all too often are lost in a world in which their day-to-day surroundings are but a dull background to the daily oscillation between the blackboard at school and the television set at home. They don't know about their surroundings so they don't care about them.... Children who feel the fascination of their environment are likely to want to see it cared for.

REFERENCES

National Science Board Commission on Pre-College Education in Mathematics, Science and Technology. Educating Americans for the 21st Century. Co-chaired by T. Coleman, Jr. and Cecily Cannon Selby. Washington, D.C.: National Science Board, National Science Foundation, 12 September 1983.

Outdoor Biology Instructional Strategies (OBIS). Written and developed by Outdoor Biology Instructional Strategies, Lawrence Hall of Science, University of California, Berkeley, CA, 1981. Nashua, New Hampshire: Delta Education, n.d.

Stake, Robert and Jack Easley. "Case Studies in Science Education Executive Summary (Chapter 19)." In The Status of Pre-College Science Mathematics and Social Studies Educational Practices in U.S. Schools: An Overview and Summaries of the Studies. Ohio State University, University of Illinois and Research Triangle Institute. July 1978.

Sund, Robert B. Piaget for Educators. Columbus, OH: Charles E. Merrill Publishing Co., 1976.

Tanner, Thomas. "Formative Influences in the Lives of Citizen Conservationists." In Current Issues V: The Yearbook of Environmental Education and Environmental Studies. ERIC Clearinghouse for Science, Mathematics and Environmental Education, Ohio State University, Columbus, OH. November 1979.

VII. Y. Sustainable Societies and the Future

Thomas R. Hudspeth, Environmental Program, University of Vermont.

Introduction: Senior Seminar in Environmental Studies

Many colleges and universities offering majors in Environmental Studies have a senior seminar. In most cases it serves as a capstone for their students' undergraduate majors, synthesizing many of the courses and experiences the students have had in college and acting as a launching platform into graduate school, careers, travel, and continued learning beyond college.

While the approaches for senior seminars vary from one institution to another, most focus on (1) environmental impact statements, (2) contemporary environmental issues, or (3) jobs in the environmental area.

In cases where the emphasis is on environmental impact statements, generally the instructors provide a theoretical overview of the legislative intent behind environmental impact statements. Students then gain skills in actually writing environmental impact statements on real or hypothetical project proposals in their communities. Often the students work as members of multidisciplinary teams in drafting their statements.

In cases where faculty and students investigate contemporary environmental issues for their senior seminar, the topics include acid rain, toxic substances/hazardous wastes, groundwater, agricultural land preservation and increased local food self-sufficiency, atmospheric carbon dioxide build-up, ecological impacts of nuclear war, changing views on public lands, the Reagan Administration's environmental record, etc.

At more vocationally-oriented institutions, the senior seminar usually focuses on environmentally-related jobs. Sessions are offered on how to write a resume, conduct a job search, have an interview, etc. Environmental practitioners in a variety of environmentally-related fields come into the class as guest speakers and give their ideas on competencies graduating students will need to successfully enter the job market in their particular areas.

Over the twelve years the Environmental Program at the University of Vermont has been offering a senior seminar to majors and coordinate majors in Environmental Studies, it has made use of the first two approaches and--to a very limited degree--the third approach as well. However, in recent years it has taken the unusual approach of making the senior seminar an "Environmental Futures" course, a course in "Utopian Visioning and Creating Alternative Futures" or "Sustainable Societies and the Future." This approach has been very successful at the University of Vermont; many other institutions offering majors in Environmental Studies have inquired about it and have emulated elements of it in their own senior seminars. The rationale behind the course and the actual mechanics of the courses--including some of the readings--are described. Course description, syllabus, and more detailed reading lists are available from the author upon request.

The Nature of the Problems

The course begins with consideration of the "nature of the problem" (often referred to as "the environmental crises," "the environmental dilemma," etc.), focusing on critical environmental problems facing the world. This international focus is necessitated by the fact that environmental problems transcend political boundaries and that many environmental concerns that were once limited to local areas are now global in scope. That is, the issues which make up the environmental agenda are too large, too all-embracing, and too complex to be treated as purely domestic concerns; most are international and many are global in their ecological and political implications. The environmental problems do not fit neatly within the lines on a map, and what one nation or state or province does affects other jurisdictions as well. Among the problems considered are: deforestation, soil erosion and cropland loss, spreading deserts, acid rain, ocean contamination, habitat destruction causing species extinction and loss of genetic diversity, population decrease, world hunger and malnutrition, energy shortages, nuclear proliferation, dwindling resources, and threats to world security. The selection of readings for this portion of the course is based on the recognition that recent global studies "are in general agreement on the nature of the problems and on the threats they pose to the future welfare of humankind" (Council on Environmental Quality, U.S. Department of State, 1977).

Utopian Visioning

While the course participants come to some agreement on the nature of the problems through these considerations, some of them begin to feel overwhelmed by the enormity of the problems. Stating that they feel that the problems are so complex that there is little or nothing they can do about them, they express a feeling of lack of control and sense of apathy. In an attempt to offer antidotes to future shock and to apathy founded on "doom and gloom" outlooks, I then shift gears in the class to consider the ideal or utopian visions. One-half of the class reads Ernest Callenbach's Ecotopia and the other half reads Ecotopia Emerging.

I ask the students to decide if Ecotopia or the other utopia about which they read is plausible, if it is logical, if all the pieces fit together, if it is attractive, if they would want to live there. If either utopia has appeal, I ask them to consider how we can begin changing the lives we live today so that we can create that future. If neither utopia is to their liking, I ask what they would offer as an alternative.

I supplement class discussions of the ideas in Callenbach's novels and in the selected reading of the student's own choice with lectures on utopias and utopian literature. Citing Paul Sears (1966), I seek to provide a rationale for considering utopian visions:

> It would be a grave injustice to dismiss utopian thought as mere fantasy, visionary and impractical. To consider it restricted to literary forms that bear its label is to underestimate its wide prevalence, at many levels and in all cultures. However expressed, it is essentially a critique of defects and limitations of society and an expression for something better.

Writers of utopias help us explore a variety of futures, enriching the sense of human possibility, giving us models to explore, test, adopt, reject. Their work is often regarded as naive, unrealistic, impractical, impossible, idealistic, wishful thinking, out of touch with reality, fantasy "no-places." But every utopia is an implicit criticism of the civilization that serves as a background for its creation and is a reconstruction of--not merely an escape from--its author's current reality. To create an imaginary society that is plausible, attractive, and integrated requires a great deal of thought, and a thorough knowledge of the fabric of human nature, human institutions, the nature of the "real world," and their interactions. It is more than an exercise in fuzzy-headed wishful thinking.

Sustainable Societies

However, some of the students in the class (especially coordinate majors in Environmental Studies whose other majors are in such fields as Business Administration, Economics, Civil Engineering, Statistics, and Forestry) often view the whole topic of utopian visioning as "fuzzy-headed wishful thinking" and express the desire to consider more concrete, "real-world" examples. So the class then considers individuals, families, groups, communities, and societies--past and present, from other cultures as well as within our own culture--which have demonstrated ecologically sustainable development (that is, they are long-lasting, healthy, stable, steady-state in nature, environmentally sensitive). Some of the readings in Resettling America: Energy, Ecology, and Community: The Movement Toward Local Self-Reliance edited by Gary J. Coates are especially useful for this purpose.

It is interesting to note that some of the students are far more interested in reading about groups and societies which existed in the past (and, in some cases, which continue to exist today), such as the Amish, the Shakers, the Hutterites, the Mennonites, the Oneida Community, and Amana Society; while others prefer reading about present-day intentional communities, such as the New Alchemy Institute, the Farm in Tennessee, Cerro Gordo Institute, Twin Oaks, etc.

Creating Alternative Futures

This provides a smooth transition into the portion of the course which deals with the future. In lecture, I introduce the students to some of the basic methodologies employed in the art and science of studying the future (called by such names as "futurology," "futuristics," "future studies," and "future sciences"). At the same time, the students become exposed to the thinking of a wide variety of futurists through reading such journals as The Futurist, Futures, Coevolution Quarterly, The Harbinger, Alternative Futures, Utney Reader, The Ecologist: Journal of the Post-Industrial Age, and New Age Journal; such newsletters as World Future Society Bulletin, Global Perspective Quarterly, Sustainable Societies, and Interaction; and selections from a variety of books dealing with the future, many of which I discovered in resource catalogues published by the World Future Society.

What is the rationale for having students in a Senior Seminar in Environmental Studies study the future?

(1) The students have had relatively little exposure to "futuring" in their formal education. Currently, our educational systems emphasize the past and present. Most of today's elementary, secondary, and post-secondary education assume that tomorrow will be like yesterday or, at the very least, like today. They try to prepare students to live in a time that does not exist by concentrating their studies on a time that has ceased to exist.

Technological and social change are outracing educational systems that remain mainly past and present bound. Toffler (1970) points out why we must re-orient education toward a future perspective:

> Our (educational systems) face backward toward a dying system, rather than forward to the emerging new society. Their vast energies are applied to cranking out Industrial (People)--people tooled for survival in a system that will be dead before they are. To help avert future shock, we must create a super-industrial education system. An to do this, we must search for our objectives and methods in the future, rather than in the past...Education must shift into the future tense.

Reischauer (1973) points out why we can simply no longer afford an unprepared society:

> It is frightening to imagine American leaders and the voting public facing global problems as these will probably develop during the first half of the twenty-first century with the basic attitudes and emotions about the rest of the world that American education and environmental influences are likely to instill in most of them today. In the field of education, there is not time for relaxed inattention, because the twenty-first century and its problems are already here.

In short, I attempt to show the students--through systematic exploration of possibilities and probabilities of the future--that making speculation about the future is respectable.

(2) Such an approach is necessary for the environmental choices we face, which have changed considerably in scale and in nature from choices faced in the past. Partly because our educational systems have concentrated on past and partial-present awareness, our nation and the world have been surprised by many of the environmental problems examined at the beginning of the Senior Seminar. And partly because our educational systems did not use the past and present to anticipate possible futures and to consider alternative possibilities, many people are demanding oversimplified, "crash" programs to solve these complex problems.

The students learn about the future in order to better cope with and live in it. They try to understand the world futuristically and factitate their thinking in an anticipatory way about consequences in the future. They consider what they want their future to be like. They then trace back to the present tense from the desirable models of the future. They come to recognize that certain actions must take place for the desirable future to grow out of the present. They begin to feel empowered to fulfill their visions, to make them become self-fulfilling prophecies. They come to realize that their dreams, visions, and images of the future are very important, and that those with vision encounter a much greater likelihood of seeing what they desire come to pass, while those without vision tend to watch passively, out of control, as external forces buffet them about. The students recognize that ideas about the future tend to create that future:

> The relation between the real and what can be imagined is more complex than is commonly thought. That which appears to be a solid reality in the realm of things might be the stabilized, lignified, petrified, ossified result of very ancient imagination. (Berdyayev, 1952)

> The present would provide an infinite choice of futures if it were not already the projection of a story begun in the past. (Gide, 1960).

The students become familiar with the concept of alternative futures, the notion that a multiplicity of choices confront mankind and that people have a choice in determining those which are most desired. There is no single future waiting for us out there in time, but a variety of possibilities. Since we cannot know which future will become reality, our best bet is to identify a range of possible futures, giving most attention to those which seem most plausible and making plans that could work reasonably well in all of them.

World-shaping decisions in the year 2000 will be made by these university seniors and their contemporaries. These and other youth are deeply concerned about problems of the future. When they have a chance to address these problems, their capacity to think about and evaluate alternatives and their willingness to participate in constructive action solutions can be vastly enhanced. With enhanced sense of the future they can anticipate possible futures and their alternatives, prevent what they deem undesirable and create more desirable futures. And, in the process, they discover that creating the future is deadly earnest, but it is also fun and entertaining as well.

Environmental and Social Change

To work toward our utopian visions and the desirable futures we would like to create, we need skills in affecting change. Hence, the next section of the course deals with environmental advocacy or environmental and social change strategies. Case study accounts of citizen action on behalf of the environment at the local, state, regional, national, and international levels illustrate a variety of techniques which others have successfully utilized to bring about change.

The Nature of Human Nature

Those seeking to affect environmental and social change quickly realize that most environmental and natural resource problems are basically "people problems":

> In dealing with environmental and natural resource issues, one is constantly confronted by the paradox that the biggest obstacle to a more humane world for people is people. Again and again designers, planners, and managers set out to solve "real" problems and end up mired in "people" problems (S. Kaplan and R. Kaplan, 1982: 224). Many seemingly appropriate solutions to environmental problems have turned out to be unworkable because the

human element has been ignored (S. Kaplan and R. Kaplan, 1982: IX). Unfortunate and unanticipated consequences all too often accompany attempts to improve existing conditions. Such unwelcome experiences are by no means limited to particular geographic regions or socioeconomic groups. The losses that are discovered only in retrospect are all too frequently in the realm of human values (R. Kaplan, 1984: 37).

Solutions to perplexing environmental problems at the interface between people and the physical environment require an understanding of what people are like, how they perceive, how they think, how they know and experience the environment, what they care about, what they prefer, how they struggle with adversity, what assistance they receive from their culture, and the circumstances under which they behave in reasonable and constructive fashion (Kaplan and Kaplan, 1982). In short, it is imperative that Environmental Studies students seeking to work effectively with people to affect environmental and social change--to work with people to overcome environmental problems and to create desirable futures--develop a conception of human nature, a working model of what people are like, to guide them in making difficult decisions. Toffler (1970) points out that "in the most rapidly changing environment to which man has ever been exposed, we remain pitifully ignorant of how the human animal copes." To overcome such ignorance and better understand the nature of human nature, the students then read and discuss Cognition and Environment: Functioning in an Uncertain World by Stephen Kaplan and Rachel Kaplan, Seven Theories of Human Nature by Leslie Stevenson, and other selections from a bibliography on the nature of human nature.

As they read these selections, I ask the students to consider the following questions related to the issue of human nature: 1) What are people really like? 2) Why are they that way? 3) How do you know they are like that? 4) Is human nature perfectible? Is it sufficiently modifiable to permit the development of a human society that is just and humane? If so or if not, what should we do? What can we do? How can we do it? How can we devise realistic change strategies?

Citizen Participation

Certainly a key element of human nature is participation. To work effectively with people requires helping to make participation possible for them. As Toffler (1970) points out:

> Under conditions of high-speed change, a democracy without the ability to anticipate condemns itself to death. But an anticipatory government without effective citizen participation and, indeed, control may be no less lethal.

> The future must neither be ignored nor captured by an elite. Only anticipatory democracy can provide a way out of the contradiction in which we find ourselves.

With that in mind, students read and discuss a variety of journal articles on citizen participation and anticipatory democracy and portions of Citizen Participation in Revitalization of the Burlington, Vermont, Waterfront by Thomas R. Hudspeth and Anticipatory Democracy: People in the Politics of the Future edited by Clement Bezold.

Assignments

The assignments for the course provide students with the opportunity to apply what they have read and what we have discussed in seminar.

1. Oral Presentation in Class on a Sustainable Society. During the portion of the course dealing with Sustainable Societies, each student makes an oral presentation in class dealing with an individual, family, group, community, or society which has demonstrated ecologically sustainable development. In some cases, these presentations elaborate on selections in Resettling America which all the students in the class have already read. In other cases, the presentations deal with groups and societies from other cultures than our own or with groups and societies within our own culture that are not covered in Resettling America.

2. Paper on Utopia Visioning and the Creation of Alternative Futures. Throughout the semester, the students write a major paper in which they (A) lay out their utopia visions for some aspect(s) of Burlington, Vermont (location of the University of Vermont) and its society. They point out in which areas their views coincide with Callenbach's visions for Ecotopia, and in which areas they differ; and in which areas their views coincide with those in the selected reading on utopia visions of their choice and in which areas they differ. The students then (B) identify the gaps between their utopian vision (that is, their image of the desired future, what they want things to be like) and a future scenario based on extrapolation of present trends (that is, probable reality if things do not change). Finally, the students (C) devise a workable strategy for moving toward their utopian vision, a plan of action for bridging the gap between their vision and the "extrapolation of present trends" scenario. The students are asked to state their views on what humans are like and how one might best work with them in dealing with environmental issues, and are told that their strategy or plan of action should be consistent with their views on the nature of human nature.

Having the students focus on some aspect of Burlington's society is not an attempt to be parochial, but rather to "think globally and act locally." With students in the Senior Seminar in Environmental Studies from all over the country and even an occasional international student, the only geographical area students know in common is Burlington. When the students make brief oral presentations in class on the topic they wrote about in their papers, this makes the experience more meaningful than if students discussed their home towns or places they had visited but about which other students had no knowledge.

3. Term Project. For the term project, students either work alone on a paper based on traditional library research or work as part of a group on an action research project.

In the Foreword to An Incomplete Guide to the Future, Willis Harman (1979) states:

> The metamorphosis of a larva to become an adult insect begins with the degeneration of much of the larval tissue. Simultaneously there is a proliferation of other special cells, called "imaginal cells," that assume the role of prefiguring the new creature which will eventually emerge from the pupal shell. Similarly, the transformation of industrialized society into a transindustrial world has already begun, with the role of the "imaginal cell" being played by a host of social movements, intentional communities, and voluntary associations identified by terms like "appropriate technology," "voluntary simplicity," "conserver society," ecology, "Human Potential," decentralist, "new transcendentalist," feminist, person liberation, and so on.

Students opting for a traditional library research paper investigate one of the examples Harman provides and write a paper highlighting the most significant aspects of their topic and addressing the potential of the movement/phenomenon/group to provide solutions to the environmental problems confronting us.

Students opting for an action research project facilitate citizen participation in an environmental planning and management issue in Burlington. In so doing, they (A) thoroughly investigate the environmental problem or issue and write it up, (B) handle publicity (write press releases, invite newspaper and radio and television reporters to meetings), (C) work with existing citizen groups and appropriate government officials, (D) facilitate public hearings, design charettes, etc. Over the years the students in the class have dealt with every conceivable environmental issue confronting Burlington. In many cases, they have seen where they really "made a difference," where they have made significant contributions to the community and to society at large.

The same reasons for the focus on Burlington for the paper hold for the action research term project as well. Also, it is important for the students to experience success when first seeking to create desirable futures, in order for them to gain sufficient confidence to continue and expand their efforts. To enjoy success in a four month long semester course, it is virtually essential to reduce the scope of the project to a manageable level--and the local level is more efficient than a larger level by avoiding delays in the mail, difficulties in communicating with key contacts, etc.

Conclusion

Each of the seven diverse and seemingly unrelated topics dealt with in the Senior Seminar in Environmental Studies at the University of Vermont could easily be the subject of a semester-long course in itself. And many of the topics considered are not the standard fare of Environmental Studies courses at American colleges and universities. While the course is certainly not a panacea or cure-all--and is definitely not appropriate for all Environmental Studies programs--it better accomplishes what the Environmental Program faculty at the University of Vermont expect of a Senior Seminar in Environmental Studies than a course focusing on environmental impact statements, contemporary environmental issues, or jobs in the environmental arena might be expected to. Such a belief is based primarily on the testimony of alumni/former students/graduates who tell us years later that the perspective provided by the course has changed their whole way of thinking. While the course will undoubtedly continue to evolve in the future, its theme--transition toward a more environmentally sustainable society or world--will probably continue.

REFERENCES

Berdyayev, Nikolay. 1952. The Beginning and the End. New York City: Harper.

Council on Environmental Quality, U.S. Department of State. 1977. The Global 2000 Report to the President: Entering the Twenty-First Century. Washington, D.C.: U.S. Government Printing Office.

Gide, Andre. 1960. Les Nourritures Terrestres et les Nouvelles Nourritures: Poesies. New York City: French and European Publications, Inc.

Harman, Willis W. 1977. An Incomplete Guide to the Future. New York City: Norton.

Kaplan, Rachel. 1984. "Assessing Human Concerns for Environmental Decision Making." Pp. 37-56 in Stuart L. Hart, Gordon A. Enk, and William F. Hornick (editors), Improving Impact Assessment: Increasing the Relevance and Utilization of Scientific and Technical Information. Boulder, CO: Westview.

Kaplan, Stephen and Rachel Kaplan. 1982. Cognition and Environment: Functioning in an Uncertain World. New York City: Praeger.

Reischauer, Edwin O. 1973. Toward the Twenty-First Century: Education for a Changing World. New York City: Knopf.

Sears, Paul. 1966. "Utopia and the Living Landscape." Pp. 137-149 in Frank E. Manuel (editor), Utopias and Utopian Thought. Boston, MA: Houghton-Mifflin.

Toffler, Alvin. 1970. Future Shock. New York City: Random House.

VII. Z. Involving Children in Developing Their Own Environmental Projects

Eric Jackson, Department of Education, Auckland, New Zealand.

This presentation offered a teaching strategy that encourages children to do something about improving their own school environments.

VII. AA. Water/Energy Software from Virginia Tech

T. W. Johnson, Virginia Polytechnic Institute & State University, Blacksburg.

Water/Energy software developed by the Virginia Water Resources Research Center was presented, including the rationale that led to design features. Availability of the IIe-based software was discussed.

VII. BB. The Woodsman

Doug Knapp, Chesterfield County Parks & Recreation, Chesterfield, Virginia.

Enter the world of Josh Swenson, a gruff old pioneer who will share his amazing animal stories and backwoods and experiences with his guests. When John's storytelling was over, his "escort" Doug Knapp discussed how this dramatic ecology/history program has been successfully implemented in school, scouting, and public programming in the Richmond, Virginia, area.

VII. CC. Investigating the Human Environment: Land Use

Nancy M. Landes, Biological Sciences Curriculum Study (BSCS).

Land is a finite resource that is necessary to support human life. Land is used in many different ways: as living space, for growing food, for producing mineral and other resources, for recreation, for travel, and as natural or built environments for other living things. Since many interests compete for the limited available land, the problems in deciding how land will be used are complex and without simple solutions. The solutions found are trade-offs--exchanges of compromised human values or life-styles for a portion of the available land.

Decisions about land use will be made more effectively if those involved in making them have accurate information about the proposed solutions, together with the consequences. Lane-use decisions involve not only science and technology, but they must also include political, economic, legal, and attitudinal factors. Intelligent land use policies will not be made without thoughtful attention to all possible consequences for particular uses of land.

To promote informed decisions about land use, the Biological Sciences Curriculum Study (BSCS)--a nonprofit educational research and development organization located in Colorado Springs, Colorado--has developed a seven-week instructional module for high school and community college students titled Investigating the Human Environment: Land Use. The module activities provide opportunities for students to acquire accurate information about land use, to identify and analyze their own values and those of others, and to consider questions and concerns about land use issues.

Students begin the module with an assessment of their knowledge and attitudes about land use. Next, they examine how land is used in the United States today and relate that information to nine land use principles:

- Land is a finite natural resource that provides the main habitat for much of the living world, including humans.
- Land is used for many different purposes. If land is used for one purpose, its use for other purposes is limited.
- Land use has a historical perspective.
- Our need for land is increasing because of our growing population and its changing needs and wants.
- Many social, political, economic, physical, and biological considerations are involved in land use decisions.
- Each kind of land use has consequences, and many of these consequences cannot be reversed.
- People have different attitudes and values about land use. Those differences may cause conflict when an activity is proposed for a certain piece of land.
- Land use planning is a dynamic process that involves trade-offs among concerned individuals. There is no perfect land use plan for everyone.
- Many laws and regulations concern land use. Ownership of land places the responsibility for its care on the owner.

Using a decision-making model and several case studies, students learn about various physical, biological, social, economic, and political factors that affect land use decisions. They apply that knowledge by resolving a simulated land-use dilemma and by thoroughly investigating a local land-use issue.

Investigating the Human Environment: Land Use consists of a student book and a teacher's guide. The student book is designed to provide sources of information about land use that will affect the land use decisions of the future. The program focuses on the development of independent thought and a healthy skepticism; Land Use is intended to sharpen the problem-solving skills that lead to good decisions. The teacher's manual is a practical guide for achieving the goals of the module through a series of activities in which students take an ever-increasing responsibility for their learning. Intellectually, the emphasis is on the land use questions of our time--questions that must be examined from societal as well as scientific points of view. Pedagogically, the focus is on the individual student as he or she develops skills in self-direction, questioning, problem-solving, and decision-making. Land Use emphasizes the development of a significant understanding of the decision-making processes in a democratic society.

For information about ordering the module, contact Kendall/Hunt Publishing Company, 2460 Kerper Blvd., P. O. Box 539, Dubuque, IA 52001. For more information about other BSCS programs, contact BSCS, The Colorado College, Colorado Springs, CO 80903.

VII. DD. Cable Television, High Tech Terms Papers, and Stoughton's Toxic Waste Blues*
Steven E. Landfried, Stoughton High School, Stoughton, WI.

* © Steven E. Landfried 1985

The increasing presence of cable access television stations and video equipment in schools offer tremendous opportunities for learning about economic and political realities of environmental problems in local communities. These options were explored during the fall semester of the 1984-85 school year in the Contemporary Affairs course at Stoughton High School in Wisconsin.

This pilot social studies education learning experience resulted in the production of three high-quality investigative video documentaries ranging in length from 42-52 minutes. Programs included: "Stoughton: Toxic Blues?", "School Budget Cuts--Cost vs. Quality", and "Cambodians in Stoughton". Each program was used a catalyst for discussion at each of three Stoughton Public Issues forums. The lively exchanges were video taped by WSTO-TV, edited, and transmitted on repeated occasions over the local cable access station. Conscious efforts were made to distribute the experimental teaching model and the substance of the topical discussions to local, state, and national media.

The investigation of toxic waste problems associated with five old toxic waste sites in the Stoughton area had several goals:

1. To provide students with a first-hand opportunity to research a local issue of their choice in depth.
2. To explore the complexity of an environmental issue from diverse perspectives.
3. To study the role of economic considerations in people's view of the seriousness of the toxic waste situation in Stoughton.

4. To develop research, communicational, and assertiveness skills crucial for informed and active citizen participation in community affairs.

5. To explore ways in which student research can be used as learning tools for others.

6. To demonstrate the feasibility of teachers and students working cooperatively with cable access stations and media on a well-balanced research/education project.

7. to actively and constructively solicit and involve diverse elements of the community in thoughtful discussions of issues of major local importance.

8. To widely disseminate the nature and results of the project.

The research team for this project consisted of a 12th grade male and an 11th grade female. The students chose their research topic from a list of local public issues generated during class discussions early in the semester. Taping and editing equipment was provided by the local cable access station and the school district's media department. Camera work was done by the instructor of the course.

Students were charged with responsibility for delineating various aspects of their research problem; identifying and contacting potential interviewees; conducting interviews; cataloguing the visual and audio content of interviews; developing a story-line; participating in the writing of text and editing of the program; providing narration for the sound track; promoting greater public awareness of their efforts; and dealing with representative of local and regional media.

Public awareness and interest in the student's research was purposely stimulated by the local newspaper, The Courier-Hub, through a series of pre-planned articles and reports, well illustrated with photographs.

"Stoughton: Toxic Blues?" premiered at a community issues forum with an audience of approximately 50 people. An active effort was made to build a meaningful cross-section of people at the forum. This included sending personalized letters of invitation to the 20-25 people interviewed for the program, school board members, city council members, teachers and administrators, members of appropriate legislative committees, and the Madison press corps.

The debut of the documentary sparked a lively discussion. The format was a subdued version of the "Donahue" talk show. Stoughton Community Television video taped the interaction with three cameras. The documentary later aired on the local community access channel on 6-10 separate occasions; sometimes with the forum, sometimes not.

Considerable media attention widely disseminated the results of the student's research. Madison's evening newspaper, The Capital Times, a frequent reporter of toxic waste problems in Stoughton, ran a front-page story on the documentary and forum the next day. A followup article followed in the next issue of the Courier-Hub. The project was also featured prominently in a feature distributed nationally by Associated Press in July. Follow-up articles appeared in the newsletter of the Wisconsin Department of Public Instruction, the National Council for the Social Studies, and TV Guide. Portions of the program were distributed via satellite to 21 states by the National Education Association.

Efforts are being made to encourage environmental educators and conservationists to replicate the project. Duplicates of video tapes have been widely circulated to educational, governmental, and civic leaders. Transcripts of the toxic waste program have been sent to elected officials, conservation groups, and educators at state and federal levels. Students, representatives of the local media, and this instructor are scheduled to make presentations to conventions of the Wisconsin Education Association, the Wisconsin Association of Environmental Educators, the National Council for the Social Studies, and the North American Association for Environmental Education.

Educational interest in this project at state and national levels has focused on four aspects of the project:

1. People have been intrigued by the ways community-based research on vital environmental, economic and political issues gives students an unusually creative outlet for exploring a visual medium they have grown up watching.

2. Others are excited that academic skills traditionally associated with science or social studies term papers can be developed and expanded in a form easily shared with decision-makers and the general public.

3. The project has triggered people's imagination about other ways schools, local newspapers, and cable access stations can work together constructively to study and disseminate in-depth information about complex community issues.

4. In each case, the project demonstrated the effectiveness of community research in making sense of seemingly parochial perspectives on an increasingly common environmental problem.

The experience has demonstrated the power of innovative student-generated research in the community. There is evidence that the magnitude of the exposure given to the project influenced decision-makers. For example, city of Stoughton officials reported improved cooperation from the Department of Natural Resources after the students started digging around in the local toxic waste mess. Indeed, representatives of Stoughton and the state got together on a face-to-face basis for the first time only two days before the premier of the documentary. Five months later, the Hagen Site east of Stoughton was finally added to the EPA Superfund list.

VII. EE. Need to Network

James M. Martin, Alberta Environment, Edmonton.

"Environmental education" is difficult to define operationally, often hidden under one of many other categories; environmental education tends to get done in isolation from the efforts of others of like mind. Environmental educators tend not to fit into any defined bureaucratic structure and work individually or in very small groups, quite isolated from others in the field. The need to network, to communicate, to loosely organize, is critical if environmental education is to advance and be widely recognized.

VII. FF. Schools and Provincial Government Cooperate to Monitor (Benthic) Quality of Alberta Rivers

James M. Martin and Lillian Hampel, Alberta Environment, Edmonton.

Alberta Environment has sponsored an education program where Biology 10/20/30 students (high school) carry out a benthic monitoring and reporting program of selected Alberta rivers. This information is then submitted to Alberta Environment for analysis and a report is then returned to the schools. The monitoring information is used by Alberta Environment for its longitudinal studies of water quality.

VII. GG. Focus on the Physical Environment--An Extended Field Trip for Science Educators

Garry D. McKenzie, Department of Geology and
Mineralogy, The Ohio State University.

Introduction

Most environmentalists would be shocked if I were to tell them that I do not give a damn about birds, trees and flowers. As an environmental geologist I understand the necessity of having an holistic view of the world and the importance of considering the biological, physical, social, economic, and cultural environments, in environmental studies, planning, and education. But the physical environment is often ignored by environmentalists and teachers of environmental science. Emphasis is on the biosphere, on wildlife and the living world. The substrate on which the biosphere depends apparently is considered to be uninteresting and static.

In this paper, my focus is on the physical environment--specifically the geological aspects--to draw attention to this neglected area of environmental science and education. To emphasize the importance of the geological environment, I describe our Appalachian field course, which has been offered for more than two decades at The Ohio State University. In addition to providing the traditional geology taught on field trips, this course illustrates the role that geology plays in civilization and the control it exerts on the rest of the environment and the biosphere. This field course is designed for science educators, so its discussion here also serves to emphasize the importance of field studies and trips for anyone engaged in environmental education. Although the course is mainly about geology, the ideas presented apply to any field-oriented discipline.

The two objectives of this paper, in addition to describing a field trip, are:

1. to emphasize the need for more attention to the physical environment by those in environmental studies and education; and

2. to stress the importance of field work and trips for educational programs in environmental science.

Before giving an overview of our field trip including trip organization, objectives, details of the geology along the route, and activities, I share some thoughts on the importance of field trips. Finally, I describe our educational approach followed by a summary and conclusion.

Importance of Field Trips

Field discussions and trips are important factors in the education of the geology student. Many university geology courses have field components; the summer field course, with a large mapping component, lasting from three to eight weeks, usually is the culmination of undergraduate education. At the graduate level, field research plays an important role in the student's development, and some students spend months in the field gathering data. When the student becomes a professional geologist she/he does not leave the field behind. It is in the field where data will be obtained to prove or disprove the hypothesis on which a study is based. And often it is in the field where the best questions are formulated and multiple working hypotheses developed. Also, as professionals and as graduate students, geologists participate in field trips as components of scientific meetings. Discussions on the outcrop during these trips are actually an aspect of the scientific method. The data and ideas are open to scrutiny by other members of the profession during discussions.

Thus for most geologists the usefulness of field trips is not questioned. It is an essential activity for those studying the physical environment or those engaging in any type of field-based science. Unfortunately, this is not the case at the precollege level.

Many explanations have been offered for the paucity of field trips in earth science and other field-based sciences. Most explanations are probably valid to a degree, but from experience I consider the following as the most common legitimate explanations:

1. The importance of field work is not understood, so little attempt is made to overcome bureaucratic obstacles or to put forth the extra effort;
2. The subject matter is not well understood by the teacher and there is a tendency to avoid the spontaneous environment characteristic of the field;
3. The teacher is unfamiliar with field techniques; and/or
4. The teacher is unfamiliar with the organization of field trips.

The fourth point applies mainly to longer field trips with complicated logistics; most teachers are comfortable with campus field activities.

If the class can get into the field, the rewards for students and instructors are significant. Subject matter and techniques can be readily examined in the field. For most of the geosciences, the field setting is the ideal laboratory (Thrift, 1975). Here the scale of the science can be appreciated and an understanding of nature of field evidence discovered. Field trips are also enjoyable; both students and instructors are inspired to lengthy discussions in the field.

A Field Trip for Educators

In order to teach geology, it is important to know and understand the subject matter and some of the techniques used to obtain evidence and data in this field-based science. This was recognized by the National Science Foundation (NSF) years ago, and as part of an Academic Year Institute NSF funded a field course for earth science teachers in the 1960s. After NSF support ceased, our course expanded to include other science teachers and a few students in natural resource management. The course is now offered in alternate years for 10-25 participants.

The five-day field trip traverses six states and six geomorphic provinces and provides participants with the opportunity to study the physiography, structure, stratigraphy and geologic history of a variety of terrains. Within the six physiographic provinces (Table 1) seen during the trip, students see examples of many rock types, cyclothems and unconformities, and plant and animal fossils.

Table 1. Physiographic areas included in the field trip.

Division	Province	Sections Visited
Appalachian Highlands	Piedmont	Upland
	Blue Ridge	Southern Section
	Valley and Ridge	Tennessee Section
	Appalachian Plateaus	Allegheny/Cumberland
Interior Plains	Interior Low Plateaus	Bluegrass or Lexington Plain, Highland Rim
	Central Lowland	Till Plain

We see essentially flat-lying sedimentary rocks in Ohio, West Virginia and Kentucky, folded and faulted sedimentary units in Virginia and Tennessee, and igneous and metamorphic rock in North Carolina and Virginia. We also see major faults such as the Kentucky River fault, Copper Creek thrust fault, and a series of thrust faults in the Narrows area of the New River. Folded sedimentary units and the impressive change from nearly horizontal units to steeply dipping and even overturned units are seen along the Appalachian Structural Front. Much of the structure is revealed through the geomorphic features of the landscape and students learn that structure has an influence on resultant landforms and the overall landscape of an area. For additional information on the geomorphology, structure, stratigraphy and geologic history of North America, students find King (1977) and Thornbury (1965) to be good references.

During the trip participants maintain a log, make general environmental observations, solve field problems, and respond to questions in the guidebook (McKenzie and Utgard, 1985) for the field trip. Activities before the trip include written and oral reports on geomorphic provinces, review of introductory geology concepts and field geology techniques (Compton, 1962), and lectures on the regional geology. After the trip, participants have two options. They may complete a research paper on a geological or environmental topic, or they may prepare a teaching unit related to some aspect of the trip. Samples and photographs obtained during the trip often comprise part of these teaching units. Field logs and field problems are also handed in after the trip for review.

Environmental and economic geology are also components of the trip. The natural resources of the physical environment and their relation to the economies and culture of an area are explored. Geologic hazards such as erosion, sedimentation, landslides, and floods are discussed and evidence of these processes presented. Participants observe the long-term effects of unregulated strip mining and the improvements that resulted from environmental action. In a visit to an unreclaimed strip mine, the controlling influence of substrate is seen in the unvegetated, steep spoil banks. The realities of economic geology are also explored at a coal-fired electric plant and a granite quarry.

The geological and environmental objectives are met with the above activities and reports. The educational objective of building teacher confidence is met by working in groups to solve the problems presented during the trip. Reinforcement of student ideas by faculty and colleagues in the field and the satisfaction gained in learning through participation build the confidence of each participant, even if that person has had limited course work in geology. Seeing how a field trip is run and the relaxed environment in which it can be conducted provides additional confidence for teachers who want to run their own trips.

No survey and analyses of the many participants who have completed the field course has been undertaken to assess subsequent inclusion of field activities in their courses. Discussions with some participants 5 to 10 years later suggest that many are taking a field-oriented approach to teaching earth and environmental science and certainly have gained confidence in both field and classroom activities.

Educational Approach

Two ideas are important in the remote support approach used in this course. An inquiry-based, problem-solving approach similar to guided design (Goldberg and Shuman, 1984) is used mainly during field problems and interpretations. Because students lack the experience and training of a geology student, they must ask for help as problems develop, or when instructors see a need for more guidance, help is given. This is the remote support that is provided. The second idea in our educational approach also borrows from guided design; this is the group approach (McKenzie and Fuller, 1985). Students work in pairs or larger groups to solve the problems. Thus, peer teaching plays an important role.

Summary and Conclusion

This field course, developed over two decades, serves the needs of science educators for field training and trips. Such experience is essential in building teacher confidence for both classroom and field teaching. It also provides teachers with a better understanding of geology and the nature of field evidence. Teachers also obtain materials that are useful in teaching earth science and environmental science on these trips, and the interdisciplinary component is of particular benefit to the participants from life sciences and natural resources.

With experience gained through field trips of this type, participants realize that:

1. Field work is the foundation of environmental science, and

2. Field experience is the heart of environmental education.

The interdisciplinary component of the trip and participation by students from many fields of environmental science should focus more attention on the position of the physical environment in environmental science and education. The geological component, with its resources and hazards, has been under-represented or ignored by many environmentalists. Courses of this type should help to correct the deficiencies described here.

REFERENCES

Compton, Robert R. 1962. Manual of Field Geology. New York, Wiley, 378 p.

Goldberg, Fred M., and James C. Shuman. 1984. Using Guided Design to Help Students Learn About the Energy Problem. Journal of College Science Teaching, 14:122-127.

King, P.B. 1977. The Evolution of North America. Princeton, Princeton University Press, 197 p.

McKenzie, Garry D., and Russell O. Utgard. 1985. Field Guide to the Geology of Parts of the Appalachian Highlands and Adjacent Interior Plains. Columbus, Ohio, Zip Services, 155 p.

McKenzie, G.D., and J.O. Fuller. 1985. Group Approach to Solving Problems (GRASP) in Introductory Geology (abstract). Ohio Journal of Science, April Program Abstracts, 85(2):52-53.

Thornbury, W.D. 1965. Regional Geomorphology of the United States. New York, Wiley, 609 p.

Thrift, D. 1975. Field Trips--a Priceless Ingredient. Journal of Geological Education, 23:137-139.

VII. HH. A Water Quality Monitoring Program: Community Environmental Problem-Solving For High Schools

Mark K. Mitchell and William B. Stapp, School of Natural Resources, The University of Michigan.

Introduction

The water quality monitoring program comprises a scientific index for measuring water quality and an educational approach to increase student and teacher involvement in a community environmental problem.

The index used is the Water Quality Index developed in 1970 by the National Sanitation Foundation in Ann Arbor. Nine water quality parameters constitute this index: dissolved oxygen, fecal coliform, pH, biochemical oxygen demand (5-day), temperature, total phosphorous, nitrates, turbidity, and total solids. Water quality results from the nine parameters were used to calculate an overall water quality index; this is a single number representing river water quality at the sampling area. The index is useful for monitoring changes in river water quality over time, comparing water quality of different river stretches, and comparing water quality of different rivers.

The water quality monitoring program aims to facilitate science education within the context of a community environmental problem. To increase the connectedness of science education to pertinent community environmental problems requires:

1. an interdisciplinary approach to examining community problems;
2. an awareness (and commitment to eliminate) institutional constraints in education to community environmental problem-solving;
3. an educational approach which encourages rather than discourages student involvement;
4. an increased awareness about the community environmental problem;
5. development of special curricular materials; and
6. information gathered is used for a purpose.

The water quality monitoring program, through its evolution in a few public high schools, has endeavored to follow the above requirements. To understand more clearly how the water quality monitoring program works in response to a community environmental problem, this program as it was conducted at Huron High School in Ann Arbor will be described.

The first water program included five general biology classes (Age 15) in the spring (April 27-May 7, 1984). Class size varied from 18-25 students. A similar water program was organized in the fall (October 15-23, 1984) and involved three advanced placement biology classes (Ages 16-17). The average class numbered 15 students. Because the basic design of the water program remained unchanged between both experiences and because both experiences shared the same community environmental issue, further descriptions pertain to both.

Review of the Community Problem

The object of the water program is the Huron River and, specifically, Gallup Park. Gallup Park is a popular windsurfing area on the Huron River downstream from most of the major storm drain outlets in Ann Arbor. These storm drains carry stormwater runoff from city streets, parking lots, and driveways and empty this untreated runoff into the Huron River. Illegal sanitary connections into the storm drains contribute fecal coliform bacteria and the possibility of pathogenic bacteria.

The community environmental problem focused upon by both water programs was health risks to windsurfers from exposure to high fecal coliform bacteria levels at Gallup Park. Fecal coliform are enteric bacteria derived from humans and other warm-blooded animals and are not considered harmful in themselves. Because fecal coliform are easily measured and are also found in humans with a disease or illness, as fecal coliform levels rise in water, probabilities of contracting pathogenic bacteria, viruses, and/or parasites increase. The EPA fecal coliform limit for total body contact, like swimming, is 200 colonies/100 ml water. Above this fecal coliform level, the risk of contracting diseases or illnesses such as dysentery, hepatitis, typhoid fever, diarrhea, giardiases, and local infections becomes unacceptable. Beginning windsurfers spend more time in the water than on their sailboard; this increases their risk of contracting a disease or illness through ingestion by mouth, through the nose and ear openings, and through cuts in the skin.

The Ann Arbor Parks and Recreation Department, which administers Gallup Park, asserts that windsurfing is not a total body contact sport, rather it is a partial body contact sport, like boating. The accepted fecal coliform limit for partial body contact is 1,000 colonies/100 ml water. After a heavy rainfall, measured fecal coliform levels at Gallup Park violate both partial and total body contact limits. Windsurfing at Gallup Park is still sanctioned by the Ann Arbor Parks and Recreation Department; however, swimming is not allowed there.

This background information is needed in order to understand the community environmental issue considered by the spring and fall water program.

Process of the Water Quality Monitoring Program

The process followed in this water program, along with activities, can be described through the six major points to increasing science education involvement in community environmental problems.

1. Aside from using the Water Quality Index to measure overall water quality at Gallup Park, students also investigated water quality from a biological and a political perspective. Students collected and identified common benthic macroinvertebrates like mayfly nymphs, dragonfly nymphs, and aquatic beetles. River water quality was measured through an estimate of biological diversity; the greater the diversity of organisms found, the higher the water quality of that river stretch.

Water quality at Gallup Park and associated health risks to windsurfers from high fecal coliform levels was also a political problem. Students read in the local newspaper that the Ann Arbor Parks and Recreation receives revenues from leasing the Gallup Park area to windsurfing companies. Also, they did not want Gallup Park perceived as an unhealthy area for recreation. Students examined this problem from a physical-chemical, biological, and political perspective.

2. There were a few institutional constraints encountered during planning and implementation of this water program. These constraints were: difficulties in scheduling activities which required more than 55 minutes (one class period), lack of funds for the purchase of water testing kits, and difficulties in bringing students and teachers from different high schools together. Field trips to collect and identify benthic macroinvertebrates often required after-school arrangements or a weekend day. Fortunately, The University of Michigan had enough water testing kits. Most of the money spent was earmarked for textbooks. Students and teachers from Huron High School and Belleville High School (another water program site) met after school but there was no mechanism in place for this meeting to occur.

3. The water program is inherently an action-oriented approach to science education. Student involvement is critical for the success of the program. In small groups (3-4 students), students work together to:

a. discuss personal and community actions which affect Huron River water quality;

b. practice the water quality tests;

c. monitor river water quality;

d. analyze the water quality data collected;

e. derive an overall quality index from these data;

f. draw conclusions about water quality and the appropriateness of current recreational usage of the river;

g. identify probable sources of any water quality problem; and

h. act to increase community awareness and appropriate actions concerning water quality problems.

4. Students became more aware of the community environmental problem--health risks to windsurfers from high

fecal coliform levels--through first-hand testing for fecal coliform bacteria at Gallup Park, through reading and class discussion of newspaper accounts of the windsurfing controversy, and through interaction with friends who windsurfed.

5. Students used a Learner's Lab Manual to Monitoring for Water Quality throughout the water program. The lab manual discusses interrelationships among water quality parameters, natural and human sources of these parameters, effects upon aquatic organisms from changing parameter levels and from physical changes in the river, detailed instructions for running the nine water quality tests, and the use of aquatic organisms as water quality indicators.

6. Based on the fecal coliform data collected by students--most of the data showed violation of the total body contact limit of 200 colonies/100 ml water--the following solutions were proposed by the students:

a. disallow windsurfing at Gallup Park;

b. erect signs at Gallup Park which clearly communicate to windsurfers possible health risks, particularly after a rainfall;

c. because illegal sanitary connections were found in the storm drains, removal of these connections needs to be made, and;

d. treatment of stormwater wastes.

Some students wrote "letters to the editor" in response to class measurements of high fecal coliform levels at Gallup Park. An article was written for the school newspaper by one of the students which described the water program and explained what the windsurfing controversy was. Students also composed letters to the city council of Ann Arbor outlining their concerns about appropriate recreational usage of Gallup Park.

VII. II. Programming for Environmental Education in the Future

Richard Mrazek, University of Lethbridge, Lethbridge, Alberta

This presentation described a more holistic approach to integrating Credit Programming in post-secondary environmental education proposed for the Environmental Education Institute of the University of Lethbridge. The Institute will display leadership and articulate efforts within the province to provide preparation of an environmentally literate adult citizenry. It lends itself to articulate environmental education in Alberta universities, colleges, other government institutions, and independent stakeholder groups while allowing self-direction within each group.

VII. JJ. Spaceship Earth Revisited

Robert W. Pultorak, Gloucester County College, Sewell P.O., New Jersey.

Use of the Spaceship Earth concept as a theme for a self-paced, individualized course in environmental science was detailed, as designed for non-science majors in the community college setting.

VII. KK. Corporate Issues and Environmental Education: A Broad Environmental Training Program

P. J. Puntenney, Ann Arbor, Michigan.

Part of moving toward a sustainable future depends upon business and industry recognizing the need to go beyond legislation and regulations. The role of environmental education and training in the corporate setting serves as a mechanism for building linkages. Currently there are new approaches being developed that are emerging from concerns around human behavior and managing hazardous waste. This paper explored the structural elements around which such an environmental education training program may be built.

VII. LL. Pennsylvania Environmental Education Master Plan

Louis Ritrovato, Pennsylvania Bureau of State Parks; Dick Touvell, McKeever Environmental Learning Center.

A statewide Environmental Education Master Plan has been developed for Pennsylvania. It was an 18-month process, from July 1983 through December 1984. Three main objectives of the 43-member task force were:

- to assess the status of environmental education in Pennsylvania.

- to establish a statewide network of organizations, agencies and individuals to promote environmental education.

- to recommend the structuring and implementation plan for Pennsylvania's environmental education network.

In accomplishing the objectives, the task force formulated 17 major recommendations which provide a foundation for a statewide environmental education network. One of the key recommendations was the creation of an Office of Environmental Education to function as the nucleus of the network.

The recommendations were targeted to various units throughout the state, i.e., The Department of Education, State Board of Education, intermediate school units, school systems, higher education, resource management agencies, community and environmental organizations, youth organizations, religious organizations, the corporate community, environmental education facilities, professional environmental education organizations, The Pennsylvania House and Senate, and the media. The Office of Environmental Education has been established and is housed in The Department of Education, with joint funding from The Department of Environmental Resources. The Director for The Office of Environmental Education is responsible for implementing the master plan.

Critical to the master plan's success is the appointment of an advisory council and the funding and staffing of environmental education specialists at the intermediate school units. These specialists will provide the linkage between The Office of Environmental Education and all others units of the network. The overall goal of the master plan is to give new direction to environmental education across the state of Pennsylvania.

Major Recommendations

Office of Environmental Education: The Governor should establish an Office of Environmental Education by Executive Order; this office should then be made permanent by legislation. The office should be housed in the Department of Education, at a bureau level. This office must maintain a direct liaison with the Secretary of the Department of Environmental Resources.

Staffing: The Department of Education should employ one director, two environmental education specialists and one administrative assistant to perform the duties and functions of the Office of Environmental Education in accordance with the Commonwealth's standards and procedures.

Budget: Monies should be made available to operate the Office of Environmental Education and its accompanying network during its first and second years of operation. The rate of growth of the network will determine the funding levels for subsequent years.

Advisory Council: The secretaries of the Department of Environmental Resources and the Department of Education and the Chancellor of the State System of Higher Education should establish an Advisory Council to the Office of Environmental Education.

State Board of Education: The secretary of the Department of Education and the Pennsylvania State Board of Education should strengthen environmental education in the classroom by mandating curriculum regulations within Chapter V of the Pennsylvania School Code.

Intermediate Units: The secretaries of the Department of Education and the Department of Environmental Resources should ensure that the intermediate units become the vehicle to coordinate the delivery of curricula, materials and training to local, public, private and parochial school systems.

School Systems: The secretary of the Department of Education should charge public, parochial and private schools throughout Pennsylvania with implementing a comprehensive environmental education program as mandated.

Higher Education: The Office of Environmental Education should seek the cooperation of institutions of higher education to provide leadership in delivering environmental education undergraduate, graduate and continuing education courses.

Resource Management Agencies: The Office of Environmental Education should encourage resource management agencies to participate as an integral part of the network, thereby expanding their leadership role and utilizing their resources to the fullest potential.

Community and Environmental Organizations: The Office of Environmental Education and the secretaries of the Department of Education and the Department of Environmental Resources should encourage community and environmental organizations to participate in and support the environmental education network.

Youth Organizations: The Office of Environmental Education should seek the cooperation and involvement of all youth organizations to promote environmental awareness and action in their local communities.

Religious Organizations: The Office of Environmental Education should seek assistance from religious organizations who wish to promote environmental awareness.

Corporate Community: The Office of Environmental Education should encourage businesses and industries to become an integral part of the environmental education network.

Environmental Education Facilities: The Office of Environmental Education should promote the utilization of environmental education facilities such as museums, zoos, and nature, science and environmental education centers to expand and deliver environmental education to the public.

Professional Environmental Education Organizations: The Office of Environmental Education should provide leadership and play an active role to unite environmental education professionals from all the network organizations into a synergistic voice in order to more effectively support the mission of the network.

Pennsylvania House and Senate: The secretaries of the Department of Education and the Department of Environmental Resources should work with the General Assembly to assure the success of the Office of Environmental Education and accompanying network.

Media: The Office of Environmental Education should design and establish a system for distributing and exchanging environmental programs and information utilizing the mass media.

VII. MM. Around-The-Building Field Trip

Helen Ross Russell, Environmental Education Consultant, Jersey City, New Jersey.

School grounds are the most valuable resource available to any school for tying textbook, media, laboratory and away-from-school learnings into concrete understandings, responsibilities, and lifestyles. The grounds surrounding any school are a microcosm of the community in which the school is located. The very absence of school grounds in a small percentage of urban areas is a dramatic illustration of the overcrowding, the poor planning, and the lack of administrative caring that typifies the neighborhood. In situations like this, school ground studies become sidewalk studies just as children's play areas become the sidewalks and streets.

At all events, school grounds in urban, suburban, and rural, in affluent, middle income, or poverty areas provide an opportunity for on-going studies to convert facts to understandings in many disciplines--and it is these understandings that may well make a difference in human survival.

Many elementary school classrooms have pets. At best, children care for them, clean the cages, and provide food and water. They learn the basic needs of individual animals and often form close attachments to them. But they do not learn relationships, and frequently the attachment that develops between children and pets opens the doors to an unrealistic, sentimental approach to game management and population control.

After basic facts have been learned about animals, a schoolground census can raise many questions. If the survey reveals no animals, the question is "Why"? If there are many animals in one area and a few in another, what are the differences? If an over-population of pigeons makes an unpleasant, possibly unhealthy, area, what contributes to the problem? What can be done to bring the population under control?

If there are spiders, what are they eating? What are the insects eating? What ratios exist among plants, insects, spiders? Are there other predators on the school ground? How are they important? Would some planting improve your school area while it provides food and shelter for a variety of animals?

Of course, planting offers other opportunities for learning. An amazing number of city children have no idea where their food comes from. If children and adults believe that the source of food is the grocery store, the importance of soil, water, and land use is totally unappreciated and ultimately protective laws are not supported at the polls.

Water studies are every bit as important as plant studies for an understanding of land management. What happens to the rain that falls on a school ground is probably a good sample of what happens in the community. Do plants slow it and help it sink into the ground? Does bare soil wash away, become gullied, deposit silt in low places? Does water dash over asphalt and concrete on its way to the sewer?

Rain samples returned to the classroom for testing can provide insights on acid rain, on the cleansing property of water, on the carrying power of running water, and on the amount of air pollution in the area. An off-the-school-ground study may develop from this as a class seeks to find the source of the pollution. Several years ago a class in Eastern Massachusetts discovered that their school furnace was a major source of the local pollution and, after study and research which started in the basement and led to the library, they approached the school board and community with data and photographs, thereby successfully bringing about change and learning much in the process.

Air, too, is universal. Every person uses an average of three pounds of oxygen a day, and returns it to the air as carbon dioxide and water. A cubic foot of air weighs 0.08068 pounds. Approximately one-fifth of the air by bulk is oxygen. A class studying division, or using calculators or computers, can approximate the cubic feet of air required to provide a day's supply of oxygen for one person. How many cubic feet of air is in the building? On the school grounds? How many people are using the oxygen? For how long? When the oxygen is gone, how is it replenished? How many green plants are in the area? Can they keep up with the demand, in spring, summer, fall and winter? Where does oxygen replacement come from? What are the factors that influence wind?

If most of our oxygen comes from the ocean and from tropical forests for part or all of the year, what are the implications of international interdependency? For increased clearing of tropical rainforests for farmland? Of using the ocean as a dumping ground? How important is wind?

Wind is moving air. The school ground is an excellent place to study conduction, convection, absorption, and radiation of heat, to find the answers to questions about relative temperatures of rural and urban areas of the same latitude, to learn about solar energy. It can be used as a weather station with simple equipment for recording wind direction and velocity, rain fall, temperature, barometric pressure and dew point and as a base for local weather prediction. This is often more accurate than general long term satellite prediction.

The variety of possibilities for meaningful experiences is endless:

Which way does sound travel? Is your school ground large enough to measure distance with echoes? How can we reduce noise levels? What is the effect of trees?

How is soil formed? How do decomposers help us? What things can't they work on? What problems do things that do not decompose create? How can we solve these problems? At our school? On a long term basis in the community?

How do rocks change? What kinds of rocks underlie this community? How do they effect soil? Agriculture? Building sites? Drainage?

What can you learn from daytime observations of the moon?

Many school ground topics may be repeated by different age groups. For instance, nursery school and kindergarten children are just discovering their shadows and learning to manipulate them. Making your shadow disappear is a challenge that involves thought and frequently experimentation when you are four years old, but it leads to the next question, "What is a shadow?" and opens the first doors to an understanding of the solar system and earth's relationship to the sun.

Using shadows to tell time by hourly observations, making monthly observations of shadows at exactly the same time, and making predictions relative to seasons are elementary and junior high concepts, respectively. A middle-school class studying ratios can use shadows to determine the height of the flagpole or other freestanding structures. High school students may be challenged to repeat Eratosthenes observations and computations. (It was Eratosthenes who in Alexandria around 250 B.C. worked out the circumference of the earth as 24,000 miles by observing shadows at noon on the first day of summer.)

Just as school ground experiences should not be limited to one age group, they should not be limited to one subject. Forty years ago when teaching environmental responsibility was in its infancy, the state of Wyoming taught conservation education in its middle school English classes. Their state curriculum was a compendium of field trips, local and statewide, dealing with the environment, the resources, and the resource management procedures and problems of that state. Every language skill was incorporated in this curriculum through reading, researching, letter writing, interviewing, spelling, recording, article writing and public speaking.

In the '60s some of the elementary schools of Philadelphia used art to portray their neighborhood as it was--and as it might be improved.

In each of these projects the field experiences ultimately went beyond the school property; and that, of course, is another benefit of school-ground field trips. By starting out with a variety of experiences just outside the classroom door with no transportation problems, no schedule upsets, no expense; with opportunities for on-going and repeated observations and measurements at the appropriate time in a learning experience children feel comfortable going beyond the four walls of the building. They develop good outdoor study habits and look on field trips as a normal part of the educational process. They are then ready to take full advantage of the few longer, more expensive in terms of time, money, safety, and planning, trips that a school may provide.

As John Muir said many years ago, "Whenever you pick anything up you find it tied to everything else in the universe." In today's world, the important interwoven threads not only include the interrelated pattern of all living things and earth's resources but political, economic and social factors as well. These critical interrelationships will only be understood and appreciated with good education that takes the curriculum beyond the classroom walls.

VII. NN. Learning by Design

Alan R. Sandler, American Institute of Architects, Washington, D.C.

This session was a "hands-on" exploration of how we learn, perceive, and make decisions about the environment. Session participants investigated personal teaching/learning styles, explored the design process as a decision-making tool, and experienced the process of locating local resources for classroom use. The presentation included group discussions, a slide presentation, and options for self-discovery and personal use of the materials.

VII. OO. Acid Deposition: The Environmental Educator's Dilemma

Donald Schmidt, Department of Biology, Fitchburg State College.

Providing quality environmental education never was and never will be easy! The need for quality education about the current problem of Acid Deposition is another example of a very difficult topic for environmental educators to deal with. In simple terms, the reason for the difficulty lies in the enormous complexity of environmental problems. The study of Acid Deposition is no exception to this general rule, since it involves in one way or another almost all of the basic scientific disciplines along with the usual fantastic array of social, political, and economic factors as well. If we concentrate just on the science involved, we soon discover that the topic of Acid Deposition turns out to be one that involves basic chemistry, biology, and earth science concepts. In addition, mathematical, statistical, and physics concepts are frequently woven into the study. In many respects, it turns out to be a limnological problem. However, one cannot ignore the fact that non-aquatic systems such as terrestrial soil/plant ecosystems are also intimately involved.

Now, what are the environmental education problems? It would indeed be very difficult (impossible?) to find a teacher or even a team of teachers with the background required to do justice to this very complex topic. Frequently, environmental science is taught by teachers who consider themselves to be biologists; this is logical, since one major component of the environment is the biological world. In their education, many biologists do not study chemistry, physics, limnology, soil science, and meteorology in depth. It is not difficult to find a biology teacher who will admit that they do not understand well the concept of pH, the concept of cation exchange in soil, the concept of adiabatic cooling, or the limnological concept of alkalinity.

What then are we to do, how can we proceed with education about what seems to be a topic of ever-increasing importance?

Above all else, it is important that we as environmental educators be careful not to perpetuate a whole series of emotionally laden, poorly supported "half-truths" about the topic of Acid Deposition. Education is a wonderful and powerful experience, but mis-education can and frequently does backfire on us. The major concern is that once people who are supposedly educated find out that the information they have received is misleading or invalid, they lose another small degree of confidence in the entire educational process. Think for a moment about the now frequently heard saying, "What next, it seems that everything we do causes cancer!" Ask yourself the question, why do people still smoke cigarettes when there is little doubt remaining about the risks involved with such activity? We are probably talking about a problem of incomplete education about biology, statistical considerations, chemistry, psychology, sociology and many other factors that comprise a badly jumbled education about the risk of cigarette smoking.

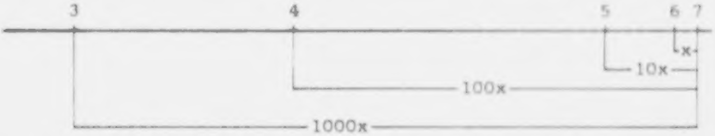
Suggestions for an Approach to Teach about Acid Deposition

In general; teach the basic underlying concepts well, support all concepts with laboratory experience whenever possible, and present "facts" only when they can be supported by scientific literature in a reputable form. If you feel that you must make some "factual statements," be sure to preface each statement with works such as: to the best of our knowledge at this time, some researchers seem to think, it is not certain but it seems..., the final answer is not in but for now it appears..., and other qualifying phrases that indicate that this is an ongoing problem in its infancy scientifically speaking. Be patient, it is safe to assume that in ten years or so many of the facts will be better established and the big picture will begin to develop more clearly and work its way into textbook materials.

Since the word "acid" is usually included in the title of this topic, it makes sense to start teaching the basic understandings of pH. This is not an easy task; it requires a good deal of personal study on the part of anyone who attempts to teach the concept. Somehow in our early education we come to think of "acid" as something that will "eat holes" in things! This is often made confusing with the teaching that we have acid in our stomach and that orange juice is acidic. So, to some degree, a bit of re-learning is needed along with this topic.

The ideas of acids/bases and pH can be approached through some activities designed to explore the so-called "pH scale". The pH scale usually illustrated in text materials is very misleading due to the fact that it is usually represented in texts as a linear scale and in reality it is a logarithmic expression of the concentration of not one but two different components, hydrogen (hydronium) ions and hydroxyl ions, that are found in a solution. Water is a good substance to start with in the consideration of pH; however, one must be very careful about using the term "pure water" unless you make sure you are talking about a theoretical substance. To top things off, you must start at the middle of the pH scale, at pH 7, which is termed "neutral." Most people are used to starting with number 1 on most scales, thus particular attention must be given to this unique approach to studying a scale. The whole science of measuring (testing) pH is complex in itself, since for the most part you will be working with low ionic strength solutions, you must abandon the use of pH papers and hydrion papers, since they work well only with stronger solutions. You must take the route of using an electronic pH meter or using known color indicator solutions that have a specific range of color change.

One thing that must be done early in the discussion of the concept of pH is the construction of an accurate pH scale. It is best if this is done by your students. By carefully studying the following diagram and using it to construct a room size pH scale, the students will begin to become exposed to the exponential nature of the scale.



Let x=1cm Note: This diagram is not to scale.

The next activity should be one where students actually measure the pH of a wide variety of common solutions, including some samples of water. I would suggest the use of tap water, rain water, pond water, lemon juice, tonic water or 7-Up and white vinegar. These are suggested due to their colorless nature, thus the pH indicator solutions will work well. If you are using a pH meter, additional colored solutions may be used, perhaps Coke and coffee. In addition to these weak acids, one good example of a very strong acid should be used under the strict supervision of the instructor (perhaps a teacher demonstration is best); I suggest the use of H_2SO_4, which will give a pH of 1-1.5 and can simply be made by adding 4 ml. of conc. H_2SO_4 to 2000 ml. of water. I also suggest the use of one substance that will give a pH reading of 8 or more which will serve to introduce the idea of a base.

The primary objective of these two activities is to make certain that students discover that substances with pH values of 3, 4, or 5 are quite common and do not "eat" holes in everything they touch.

The precipitation in New England over the past three years has been measured to be between pH 3.7 to pH 4.7 in most cases. Please avoid the temptation of preparing a standard "buffer solution" of pH 4 to be used in experiments dealing with acid precipitation. In most cases, the precipitation is not buffered at all; simply a very dilute solution dominated by nitrates and sulfates. If you cannot obtain naturally occurring "acid rain," the best way to make an artificial acid rain solution is to add 1 drop of concentrated H_2SO_4 from a standard glass eyedropper and 1 drop of concentrated HNO_3 from a standard glass eyedropper to 5 liters of distilled water. (Honestly! Acid rain is a very dilute, unbuffered solution.)

Once the concept of pH is discovered and you have been able to obtain some acidic precipitation or prepared substitute, a whole host of interesting experiments can be done. These have been outlined in many current publications and frequently involve such things as germinating seeds, watering plants, leaching soil samples, treating cultures of Daphnia or other aquatic micro-organisms, treating developing frog or fish eggs, etc. All of these and others can be very educational if you maintain good control situations by using water with a pH of 5.6 or more as your control. The reason pH 5.6 is mentioned is that given water combined with atmospheric CO_2 it is possible to have an acidic solution of about pH 5.6. Thus, traditionally, any precipitation with a pH of less than 5.6 is now being considered to be "acid precipitation". If you really want to know why atmospheric CO_2 + water = pH 5.6 solution, you must review the stoichiometry of the two dissociation constants of carbonic acid. If you really can't think of ways to design some acid precipitation experiments for students, a good place to start would be the April/May 1985 issue of The American Biology Teacher, page 228-238.

The last thing you need to do in order to do some justice to the teaching of this topic is to make a serious effort to collect some published literature about the topic. You must try to collect some articles from scientific journals. It is easy to find articles in newspapers and many contemporary magazines, but be very cautious about these often emotionally loaded, poorly designed, often erroneous articles. Nine or ten good articles from reputable scientific journals should be much more valuable than one hundred articles of contemporary nature. This is a real problem for many teachers who simply do not have access to scientific journals. It takes a considerable effort to visit a university library and make photocopies of these articles to have them available for your own use and for the use of your students. In addition, frequently teachers find that the scientific journal articles are very technical and seem to be difficult to understand. Nevertheless, this is part of the nature of modern science, and if you really intend to teach science, you must try to include scientific articles in the list of teaching materials you use.

I suggest the following articles for a starter, difficult to find in some cases, but at least a place to start:

1. Rahn, K.A., Chemical Elements Help to Trace Sources of Acid Rain, Maratimes, Feb. 1984. U. of Rhode Island School of Oceanography.

2. Rhan, K.A. and D.H. Lowenthal, Pollution Aerosol in the Northeast: Northeastern-Midwestern Contributions. Science, 19 April 1985.

3. Blank, L.W., "A New Type of Forest Decline in Germany," Nature, 28 March 1985.

4. Charlson, R.J. and H. Rodhe, "Factors Controlling the Acidity of Natural Rainwater," Nature, 25 February 1982.

5. Paces, Tomas, "Sources of Acidification in Central Europe Estimated from Elemental Budges in Small Basins," Nature, 2 May 1985.

6. Kilham P., "Acid Precipitation: Its Role in the Alkalization of a Lake in Michigan." Limnology & Oceanography, 27(5), 1982.

7. Godfrey, P.J., A. Ruby, and O.T. Zajicek, The Massachusetts Acid Rain Monitoring Project (A.R.M.) Pase I & II, the Water Resources Research Center, University of Massachusetts, Amherst, MA, 1985.

8. Evans, L.S., "Botanical Aspects of Acidic Precipitation," The Botanical Review, 50:449-490, Oct-Dec 1984, New York Botanical Garden Publication.

9. Hooper, R.P. and C.A. Shoemaker, "Aluminum Mobilization in an Acidic Headwater Stream: Temporal Variation and Mineral Dissolution Disequilibria," Science, 2 August 1985, p. 463.

10. Herczeg, a.L., and D.W. Schindler, et al, "A New Method for Monitoring Temporal Trends in the Acidity of Fresh Waters," Nature, 9 May 1985. Schindler, D.W., et al, "Long-Term Ecosystem Stress: The Effects of Years of Experimental Acidification of a Small Lake," Science, 21 June 1985.

Thus, it is clear that the environmental educator faces the dilemma of moving rapidly ahead with the emotional and volatile aspects of the acid rain problem or the alternative method of moving slowly, concentrating on the underlying basics and clearly substantiated data for decision making. I can only suggest that if this is really an environmental problem, let's try to solve the economic, political and social parts of the problem based upon a sound scientific foundation.

VII. PP. One Approach to Effectively Assisting Environmental Education in Public School Systems: A Case History

Theodore G. Scott, Jr., Piedmont Environmental Council, Orange, Virginia.

A description of the steps taken and decisions made by a young environmental organization in its effort to strengthen environmental education in school systems throughout its service region was presented. Included was discussion of several initiatives taken to develop school systems' credibility in and acceptance of a private organization's program.

VII. QQ. Using Local History for Environmental Education

Elizabeth H. Smith, Saratoga Springs, New York.

Ecological concepts observed through land use, historical records, and architecture in the New York village of Ballston Spa were discussed. Featured was a two-projector dissolve presentation.

VII. RR. Environmental Education in Action-Rationale and Activities for Elementary Students in an Urban Setting

Kay Monroe Smith, Loyola University, Chicago, Illinois.

Urban areas pose special environmental challenges to children, their families, and educators due to technological and demographic forces on the environment. This workshop introduced participants to an inquiring-based environmental education program, utilizing both educational and natural resources to investigate and preserve the urban environment. Participants addressed special urban environmental education issues and concerns, explored a wide variety of teaching-learning strategies and materials, and devised a plan and resource packet to implement in their particular setting.

VII. SS. A New Graduate Program in Environmental Studies

Oscar H. Soule and Greg Weeks, The Evergreen State College, Olympia, Washington.

This case study examines the origin of this new program, initiated in the Autumn of 1984, along with the development of the curriculum, the recruitment of students, and the implementation of the curriculum. By sharing this case study, the authors hope to encourage others to explore new and productive ways to enhance environmental education.

VII. TT. Information/Education Materials: Effects of Air Pollutants on Forest Ecosystems

Harriett S. Stubbs, The Acid Rain Foundation, Inc., St. Paul, MN.

Reports of recent forest decline have been particularly perplexing. As a result of our focus of public awareness, information, and education on acid deposition and related pollutants, The Acid Rain Foundation coordinated a Symposium: Effects of Air Pollutants on Forest Ecosystems, May 1985, in St. Paul, MN. This conference was sponsored by The National Acid Precipitation Assessment Program (USDA Forest Service, U.S. Department of Energy, U.S. Department of the Interior, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration), and Environment Canada. Thirty scientists came from Europe and across the United States to present their most recent findngs. Afterwards, their papers were compiled into a Proceedings which, to the present, has been requested by persons in Canada, Mexico, Korea, Kenya, India, Manilla, and all the European countries. Because of this interest worldwide, you may wish to introduce the topic into your teaching and other work.

Many scientific papers and findings are now currently available. This presentation is intended to be only a brief overview of information/education materials available for educators of all types on the topic of possible air pollutants' effects on forest ecosystems. There is not time to do more than show some of these effects and delineate source materials.

Problem

During the past 5 years, a large-scale regional decline of many different forest ecosystems has taken place in Germany, Belgium, France, Italy, Austria, Czechoslovakia, Poland, Sweden, and other countries in Central Europe.

This phenomenon has developed very rapidly since 1979. For example, according to the data released in 1985 by the Bonn Bundesministerium, 8 percent of the German forests were affected in 1982, 34 percent in 1983, and 50 percent in 1984. There may be some error in survey techniques, but the German forests have been affected, which results in economic, biological, and social implications.

Theories and hypotheses of possible explanation include: acidification due to aluminum, ozone, magnesium deficiency, general stress, excess nutrients - or excess nitrogen, and direct foliar damage.

Problem

In the United States, the situation is considerably different. A limited decline of high altitude boreal montane ecosystems (spruce-fir) in the Eastern United States has been in progress for the last perhaps two decades. It may be that airborne pollutants coupled with secondary factors are responsible for this forest decline. At present, there are no field studies in the United States in which any of the potential effects have been convincingly established as interfering with forest productivity.

In the Southeastern United States, the Boreal montane decline of red spruce and Fraser fir in the Southern Appalachian Mountains appears to be real.

It is more pronounced on west facing slopes, and severe synchronous annual growth increment suppression has been documented.

Theories of possible explanation include: toxic metal accumulation, little forest reproduction, mycorrhiza less with damaged trees, and root inhabiting fungi - declining trees only.

Airborne chemicals of greatest importance, which may be implicated are: ozone, nitrogen compounds, phytotoxic gases such as SO_2, , toxic metals, wet deposition and dry deposition, and growth-altering organic chemicals.

I am not a forester, but a science educator, interested in the dissemination of information on the "cutting edge" of research, information which is constantly changing and being updated. But--you decide you would like to learn about this contemporary science problem as it is unfolding. What do you need? What do you want? Some suggestions are the following:

In a previous study (Stubbs, 1980), educators when asked what materials they wanted, in order to teach about a current environmental problem, acid rain, replied that they needed, in the following order:

1. 16mm film
2. Informational materials
3. Booklet with appropriate questions for students
4. Laboratory activities

Though this topic is not acid rain, sources will be listed encompassing the above categories.

Audio-Visuals - Nova/Time Life TV tape.

Slides - available from German sources.

Books - many in German, foreign language.

Bibliography - a more comprehensive listing is available through The Foundation, or your local library. A few of those most recent sources from many different viewpoints are listed at the end of this paper.

Other Materials - core samples taken from red spruce in the Southern Appalachian Mountains have been donated to The Foundation. These are set into cherry wood and then sanded, so that the decline in size of annual rings is quite visible. Since the cause(s) of these size change(s) is (are) not known, it is hoped that these cores will stimulate the thinking of students and educators alike:

Cowling summarized, in the final session of the conference:

1. In recent months, there has been a substantial shift in scientific and public consciousness about airborne chemicals. Earlier, the major focus was on acids in rain and their effects on surface waters. Sulfur pollution and airborne acids were recognized as important but they are not the whole story. Today we recognize that ozone, nitrogen compounds and volatile organic substances are also important--especially so far as forests are concerned.

2. Renewed interest in ozone--a toxic gas--has reminded many of us that gases can enter plants directly through stomata. Other airborne chemicals, which exist as aerosols or as substances dissolved in precipitation, must enter plants by diffusion:

   *through the cuticle of leaf surfaces
   *or the bark of branches or stems
   *by even more arduous diffusion through the soil before entering the plants through their roots.

3. There is much confusion about the meaning of the word "downwind". Many people think that prevailing winds make it so that pollutants almost always move in that direction. But the wind blows in many directions, and the direction and speed of wind vary with altitude even at the same place. As a result, there is a zone of influence that extends in all directions from every source. Since the distance that pollutants travel is much greater than the average distance between sources, the atmosphere is very well mixed. In essence, in every place in North America, every place is "downwind" from every other place--some of the time.

4. Human activities are continuing to change the chemical climate of North America. The Clean Air Act is working to decrease sulfur emissions in the northeastern United States, but the same act is permitting the sulfur emissions to rise in the south. Nitrogen oxides are precursors of ozone. Emissions of these substances are rising in the northern, midwestern and southern states. Thus, forests in various regions are subjected to a continuously changing array of beneficial nutrient substances and toxic substances. The chemicals in the air change:

   *in response to various policies
   *in response to regionally different patterns of industrialization, urbanization and electrification.

The Acid Rain Foundation plans to continue searching for and including listings of new materials, both information and educational, available on the topic of Air Pollutants Effects on Forest Ecosystems. As research continues, new findings become available, and the knowledge base expands, it will be important for educators to remain knowledgeable and updated about this important topic.

REFERENCES

Acid Deposition and Forests, 1984, Society of American Foresters, p. 48.

Air Pollutants Effects on Forest Ecosystems, May 1985, Proceedings from the Symposium, The Acid Rain Foundation, Inc., St. Paul, MN.

Bormann, F.H., Air Pollution and Forests: An Ecological Perspective, Bioscience, 35(7):434-440.

Forest Stress and Acid Rain, September 1985, EPRI Journal, pp. 17-25.

Johnson, A. and Siccama, T., Acid Deposition and Forest Decline, Environmental Science and Technology, 1983, 17(7):294A-304A.

Postel, Sandra, Air Pollution, Acid Rain, and the Future of Forests, Worldwatch Paper 58, March 1984, p. 54.

Prinz, Berhard, et al., Effects of Air Pollution on Forests, Journal of Air Pollution Control Assn., 1985, 35(9):913-928.

Recognizing Pollution Damage in Forest Trees, 1983, General Forestry Journal, p. 15.

Scholz, Florian, Report on Effects of Acidifying and Other Air Pollutants on Forests, United Nations Commission for Europe, April 1984, p. 85.

Schutt, Peter and Ellis B. Cowling, Waldsterben, A General Decline of Forests in Central Europe: Symptoms, Development, and Possible Causes, Plant Disease, 69(7):548-558.

VII. UU. Project Mayfly and the Audubon Ecology Camp Program

Tom Troy, National Audubon Society, Camp Hill, Pennsylvania.

Project Mayfly describes the activities of high school students in New Jersey as they monitor water quality in their communities. The Audubon Ecology Camp Program has served teachers and naturalists for almost fifty years.

VII. VV. Interdisciplinary Environmental Education for the Middle Grades

Victoria B. Urban and Charles R. Allan, San Dollar Management Systems, Grosse Point Woods, Michigan.

This presentation demonstrated the development and implementation of an interdisciplinary curriculum model for the middle grades. It suggested methods for transfer learning, a socialization process, and development of positive attitudes toward the environment. A question-and answer session was conducted.

VII. WW. Johnny Biosphere

J. R. Vallentyne, Canada Centre for Inland Waters, Burlington, Ontario.

Forty action-packed minutes of ecological fun and games with a deadly serious message in the form of guerilla theatre for elementary school children are presented by the Environmental Studies Section's 1985-86 North American lecturer. This presentation is one of several designed by Dr. Vallentyne for this tour.

VII. XX. Networking Environmental Education in Quebec: How to Stop Reinventing the Wheel (presentation in French, workshop in English)

Claude Villeneuve, Professor, Sainte-Prime, Quebec.

Many governmental and non-governmental agencies in Quebec have been involved in the production and dissemination of environmental education. Unfortunately, with no means of coordination some very good material never went out of the boxes, and too many people "reinvent the wheel" by rewriting existing materials or not using them when available. The purpose of a Quebec environmental education network would be to provide individuals, NGO's, and governmental agencies means to know about each other's production and needs, and to help spread around good existing materials. It would also help to produce and orient better Environmental Education.

VII. YY. Investigating and Evaluating Environmental Issues and Actions - Skill Development Modules
Trudi L. Volk, Murray State University, Murray, Kentucky; Audrey N. Tomera, Southern Illinois University, Carbondale

This workshop introduced the 1985 edition of a set of modules designed to develop issue investigation and citizenship action skills at the junior and senior high school levels. Research conducted on the modules was reviewed.

VII. ZZ. Incredible Edible Landfill
Richard Wagner, Wissahickon Senior High School, Ambler, Pennsylvania.

Creating a model for chemical waste in America; an open-ended student-oriented activity that never turns out the same way twice!

VII. AAA. Whole-Body Environmental Education
Michael G. Weilbacher, The Academy of Natural Sciences, Philadelphia, PA.

For years, the techniques of theatre and dramatics have been underutilized and ill-employed by educators of most disciplines. Lack of awareness, lack of training, a perception that theatre and dramatics are mere frills, and back-to-basics cost-cutting have long threatened the implementation of drama in education. But lately, educators are beginning to realize that theatre, and all the arts, can be tapped as mechanisms for teaching a breadth of information, including science and environmental concepts. The "whole-body environmental education" workshop presented during the 1985 NAEE Annual Conference aims to advocate the use of theatre and creative dramatics--through use of the "whole-body"--in environmental education.

In television production, there is a studio direction called the "talking head." When the director calls for one, the camera zooms in on the actor's head and shoulders; Dan Rather is usually broadcast as a "talking head." In many educational settings, formal or non-formal, educators often operate as "talking heads"--the head of the educator dispenses information to the heads of the students. The intent of whole-body education is to break through the "talking head syndrome"; that is, the whole body of the teacher is an instrument that can teach information to the whole body of the learner. The techniques and processes of theatre and creative dramatics are not only fertile places to plant educational seeds, but these fields are ripe for the picking by environmental educators.

Students can, for example, learn how the water cycle works through a variety of formats: textbooks, lectures, films, lab demonstrations. But learners can also become the water cycle, pantomiming the cycle's movements of evaporation, condensation, and precipitation. By moving as the cycle, some students more vividly understand how it works. Supplementing other techniques, this dramatic style of learning can be powerful reinforcement.

Research continues to reveal the intricate processes by which learning occurs. Students not only employ a variety of learning styles, but they display style preferences. One style is kinesthetic learning--these students need to move to learn, and suffer greatly in "talking head" situations. Whole-body environmental education fulfills the needs of kinesthetic learners while providing a change of pace for learners of other styles. It must also be remembered that kinesthetic learning is a valid learning style, not a learning disability, and a style that dearly needs addressing.

Whole-body EE is therefore dedicated to the concept of "the whole child--that (the) body, including (the) senses as well as physical movements, is as important as (the) mind" (Weitz, 1972). Whole-body EE borrows heavily from the fields of creative dramatics and children's theatre. Creative dramatics explores the use of theatrical techniques in an informal atmosphere with no intention of performing for an audience. Children's theatre has as a goal a live performance. Creative dramatics incorporates movement, dance, creative play, improvisation, pantomime, story dramatization, and more in meeting its objectives.

During the workshop, these techniques were adapted, "environmentalized," to teach concepts peculiar to EE settings. Many of the workshop activities were created by the author, others were inspired by sources listed later on. The activities are meant to be used and adapted in a variety of settings. Some are good introductory activities, others are great wrap-ups. Special attention has been paid to the pacing of the material to help participants warm up to the process. Notice that "low-threat" activities are done early and lead the participants into higher-threat, more-demanding material. The best activities to begin with are open-ended large-group activities, ones where a variety of responses are equally appropriate. Incidentally, when paced properly by a trained and inspired leader, creative dramatics exercises can easily lead into performance theatre, a process discussed later and modelled during the workshop.

Workshop Activities

1. Narrative Pantomime: "Metamorphosis". Narrative pantomime is a long-used technique of early childhood educators. It is also referred to as "guided movement" and "story movement." The leader simply tells a story, and the learners, guided by the leader, move to the story; they become the story.

In "Metamorphosis," the group begins curled up as eggs, and the leader relates the story of the hatching of eggs into caterpillars, then into cocoons, then into butterflies. As the story unfolds, the participants create the appropriate movements.

Narrative pantomime works beautifully with many stories: tadpoles/frogs; seeds/trees; seasonal changes, and more.

2. Theatre Game: "Noah's Ark". Joseph Cornell's (1979) Sharing Nature With Children includes this very effective game. The names of animals (duck, frog, owl, turtle, etc.) are written on index cards in pairs. Each participant chooses a card. When the leader says "Go!" the players become, through sound and movement, that animal--and search for the other person in the group who is the "mate."

3. Theatre Game: "Herds". In this game, a circle of players are assigned to be one of three animals: cows, pigs, or ducks. At the signal, each player--close-eyed!--makes that animal's sound, and tries to find everyone else in the circle that is the same animal. In the end, three herds of animals celebrate their successful search with loud moos, oinks, and quacks.

For young children, the game is still fun played open-eyed. The game can be adapted to teach various methods of animal communication.

4. Theatre Game: "Group Animals". Participants form groups of 4-5, and each group chooses a living creature, plant or animal, that it wishes to "perform." Each group member becomes one element of the creature (wings or tail or antenna) and the group then creates, "live on stage," that creature. Additionally, the group is charged with giving their creation movement.

The groups perform their group animals in turn, guessing what each other has made. Spiders, starfish, amoeba, fruit trees, and oysters are just some of the organisms performed in these workshops.

5. Creative Movement Exercise: "Food Chain Ballet". The players form two widely-spaced lines facing each other, crouching low. One player rises as the sun, and "shines" on one line. That line grows into waving grasses, and the sun joins them as a grass. The second group becomes grasshoppers, and moves through the grass, "eating" each blade in turn. As grasses are eaten, they drop into a crouch, and the grasshoppers pass through, stop, and turn around. The grasses then become frogs that eat the grasshoppers. The grasshoppers transform into snakes that eat frogs; frogs turn into hawks, swoop onto the snakes and devour them. Thereupon, everyone dies, and decays into soil; the sun rises again, and the grasses grow.

The leader begins by talking through the activity, rehearses it through, and then it's performed, with music, as the "food chain ballet."

6. Creative Movement Exercise: Concept Pantomime. Players are divided into groups of four and choose a card, upon which is written one of the concepts often taught in EE settings: "photosynthesis," "seasons," "water cycle," "endangered species," and others. The groups create simple pantomimes to teach the other participants that concept. Again, the others attempt to guess what concept the group performed.

The Clown Arts and Environmental Education

After these activities, applications of "the clown arts" (juggling and magic tricks, among others) were discussed and demonstrated. A "group juggling" exercise taught the flow of energy through ecosystems, and a "magic rainbow"--30 feet of rainbow-colored paper pulled from the leader's mouth!--highlighted a water cycle narrative pantomime.

Dramatics Into Theatre

After leading a group of players through a series of activities such as these, it is easy to see how the activities can evolve into performance theatre.

Creative movement pieces like the "food chain ballet," when added to other movement pieces on air, water, and soil cycles, or forest, pond, or ocean communities, even recycling and resource conservation, can be placed together in a sequence that is performed by the group but narrated by the leader.

Using movement with taped music, with little need for memorizing dialogue, creates a special brand of performance theatre that is economical, effective, and empowering for the performers.

When your students teach their peers what they have learned through theatre assembly programs--that's effective EE, education that satisfies the needs of kinesthetic learners, and exemplifies the best of whole-body education.

Conclusion

The importance of kinesthetics is becoming better understood as the research unfolds. Expressive arts therapists know that our body stores knowledge in "muscle memory." Pressure exerted on certain muscles may trigger emotions or deeply buried memories.

This is not, in fact, new information. Dramatist Claude Wise wrote in 1923 that "whenever it is possible, (teachers should) tie up the verbal memory process with motor memory process, (for) it is surely economy to do so." Chenfield (1980) continues: "For some people, it is the only way they can really learn... Children who rarely succeed will find many opportunities for building a healthy self-image and strengthening self-confidence if movement is correlated with all areas of the curriculum."

Thus, whenever an environmental educator leads a group of learners, kinesthetically-oriented activities must be blended in with other activities to teach to the full spectrum of learning styles. The activities presented herein are a beginning, and work in the entire range of EE settings--classrooms, outdoor walks, campfires, even as introductions to more formal events like slide-talk shows and evening banquets. The author has had great success in all these settings, and whole-heartedly, whole-mindedly, and whole-bodily recommends that environmental educators enrich their curricula and programs with many "moving moments."

REFERENCES AND SOURCE MATERIALS

Chenfeld, Mimi B. 1981. "Moving Moments for Wiggly Kids." In Kaleidoscope: Readings in Education. K. Ryan and James M. Cooper, eds.

Cornell, Joseph. 1979. Sharing Nature With Children. Nevada City, CA: Ananda Publications.

Durland, Frances. 1975. Creative Dramatics for Children. Kent, OH: Kent State University Press.

Fleugelman, Andrew, 1976. The New Games Book. Garden City, NY: Doubleday.

Weilbacher, Michael G. 1983. Watercolor Learning Theatre: A Case Study of Theatre and the Performing Arts As Environmental Education. Unpublished Master's thesis, University of Michigan, Ann Arbor, MI.

Weitz, Morris. 1972. "What is Aesthetic Education?" Educational Theatre Journal, 24:1-4.

Wise, Claude. 1923. Dramatics for School and Community. Cincinnati: Stewart Kidd Company.

VII. BBB. Regional Environmental Education Program - REEP

Barbara J. Wicks, The Tyler Arboretum, Lima, PA.

The Regional Environmental Education Program (REEP) began as a dream of Paul Stetzer of the Schulykill Valley Nature Center (SVNC) in Philadelphia two years of which he shared with fifty environmental specialists in a brainstorm meeting in March 1983. Even though Paul Stetzer left SVNC soon after that meeting, his vision of insuring that the school children in the five-country area were properly trained in environmental education is being realized.

In the spring of 1984, the William Penn Foundation and the Pew Memorial Trust funded REEP for a period of three years and Laura Lienk, Assistant Director of SVNC, began to administrate the program. Ms. Lienk sought guidance from the recommendations of the Pennsylvania Environmental Education Master Plan Task Force. The task force advised that a Pennsylvania State Director of Environmental Education be appointed and made the implementor of the master plan. The plan outlined a request that the "Secretary of the Department of Education should charge school throughout Pennsylvania with implementing a comprehensive environmental education program as mandated."[1] Dr. Dean Steinhart was appointed Pennsylvania State Director of Environmental Education in January 1985 and after learning of the REEP program, made a commitment to support it.

In December 1984, a REEP Coordinating Committee, consisting of a representative from each of the environmental education facilities in the five counties, was formed. The Schuylkill Valley Nature Center, representing Philadelphia County, was joined by the Silver Lake Nature Center and the Honey Hollow Environmental Education Center from Bucks County, the Nature Center of Charlestown from Chester County, the College Settlement Camps from Montgomery County and The Tyler Arboretum from Delaware County to form this committee. Each center was chosen because of their support of the REEP concepts, their diversity of funding and programs and their geographical distribution. This committee has begun to work with area school teachers, intermediate units and districts to promote and develop a REEP environmental education curriculum for grades K-12. During July and August, fifty teachers along with the REEP Coordinating Committee, will prepare a curriculum for piloting an upcoming teacher in-service workshop.

Our mission, promoting environmental education in the area through networking the REEP program curriculum throughout the five county area and the entire state, will succeed with the help of teachers, environmental educators, and Dr. Steinhart.

NOTE

[1] P.A. State, Pennsylvania Environmental Education Master Plan Task Force, Pennsylvania Environmental Education Master Plan, 10 December, 1984, p. 25.

VII. CCC. Natural Gas: The Environmental Protection Energy

Paul L. Wilkinson, American Gas Association, Arlington, Virginia.

There is a direct link between the combustion of some fossil fuels and a number of environmental problems. This presentation examined the sources and impacts of various air and water pollutants and solid wastes which are by-products of energy production and consumption. In addition, a number of energy utilization techniques were suggested that can reduce pollution by increasing the use of natural gas (e.g., "select gas use," gas cars, and cogeneration).

VII. DDD. Guidelines for Planning and Implementing an Historical Interpretive Day Camp

Charlotte F. Young, University of Michigan, Ann Arbor.

This report described the development of an historical interpretive camp which was implemented in Lansing, Michigan, in the summer of 1982, and which focused on comparisons and contrasts of present lifestyles and those of the mid-1800s to 1900s.

VII. EEE. Project Cone

Darrell D. Young, SUNY College at Buffalo.

Introduction

> Although the growth, development, and acceptance of outdoor education programming for the handicapped has increased over the past several decades, there is still a significant lack of appropriate materials, resources, and information available which specifically addresses the programming needs for special populations and the factors which may limit or prohibit handicapped children from full and equal participation in outdoor education programs. A review of the literature has indicated the following major reasons for this dilemma:
>
> 1. failure of the majority of readily available outdoor education curriculum materials to address the specific and unique learning needs of the handicapped;
>
> 2. lack of materials and resources which assist personnel with the process of designing and implementing an outdoor education program for disabled populations;
>
> 3. lack of awareness and training opportunities for educators, parents, and park resource personnel on the value and importance of outdoor education for this segment of the population; and
>
> 4. existing man-made, natural, and attitudinal barriers which may prohibit certain groups of disabled consumers from participating in these programs.
>
> Additionally, the majority of information that is available in the field does not adequately address the interdisciplinary teaming or the cooperative approach to outdoor education program development. The ultimate success of any educational program, especially those in outdoor education, will depend upon cooperation and coordination among all persons and/or agencies involved. This interdisciplinary relationship, whether in the home, community or school, is vital for effective planning, implementation and evaluation to occur in all aspects of education for handicapped students.[1]

The above quotation accurately indicates the state of the art in Outdoor Science Education for the handicapped. And above all, it stresses the absolute need for an Interdisciplinary Approach to the study of outdoor education in order to bring about solutions to the problem of providing that phase of life which is a right of a handicapped individual.

Purpose

This study was conducted as a sabbatical leave project and undertaken with the expressed desire to develop an understanding and working relationship between families with handicapped children, and facilities provided for outdoor recreation by the U.S. Forest Service. To this end, a two fold purpose was established and carried out during the summer and fall months of the 1983 calendar year:

1. to establish an outdoor camping weekend experience at the Chippewa National Forest in Northern Minnesota. This experience became known as and will hereafter be referred to as Project CONE (Camping Outdoor Nature Experience).
2. To promote a survey of U.S. Forest Service Campgrounds in the Eastern United States for those facilities that have been expressly developed for handicapped use.

Project Cone

Project CONE officially originated during the summer of 1982 when the author made an appointment with the Deputy Supervisor of the Chippewa National Forest located at Cass Lake, Minnesota, Dr. Ken Holtje. The purpose of this visit was to inquire about the available facilities for the physically handicapped individual in the nearby national forest.

An outcome of this meeting was an agreement to establish a weekend camping-learning experience during the month of August 1983 for families with handicapped children. The goals established at this meeting were:

1. To encourage families with a handicapped child to undertake a camping experience.
2. To provide those same families with the guidance and security that an experienced camper and the U.S. Forest Service can provide.
3. To provide those same families with learning experiences which would enhance their awareness of and appreciation for nature.
4. To promote increased use of U.S. Forest Campgrounds by handicapped individuals.

The one inherent difficulty in this project lay in the fact that its Director was a Professor at the SUNY College at Buffalo, whereas the project would be carried out in the state of Minnesota. This necessitated correspondence between Buffalo, New York, and various individuals in the state of

Minnesota. Deep heartfelt appreciation must hereby go to those individuals who gave of their own time and monies to make Project CONE the success it turned out to be. It should be emphasized here that no grant monies were available for Project CONE.

As might be expected, the response to Project CONE was small, in spite of the publicity provided by the Cerebral Palsy Association and the Muscular Dystrophy Association, both of Minnesota. A total of five reservations were made for the Project of which only two families appeared. No reasons have ever been presented for the no-shows. Of the two families who did participate, one family consisted of seasoned campers, but the other family had never been camping.

The participating families consisted of a total of nine individuals, three of which had muscular dystrophy. The three children ranged in age from 14 to 2.

Procedure. Upon arrival at the Chippewa National Forest Campground, each family was directed to select one of the especially designed campsites, to establish their campsite and to report back to the checkin point for nametags, project schedule, and folder of free literature and materials which had been collected for each family.

Project staff monitored the establishment of the campsites and provided help or advice when either needed or requested.

The following schedule of events were followed throughout Project CONE:

August 12th	8:30	Check-in and get settled time Evening campfire and marshmallow roast
August 13th	9:00-10:00	Primitive Cooking Demo
	10:30-11:30	Nature Hike
	Lunch	
	1:00-2:00	Boat rides
	Free time	
	Evening Meal	
	9:00	Bald Eagle Presentation
	Campfire	
August 14th	9:00-10:00	Visit by Woodsey Owl (U.S. Forest Service)
	10:00-11:00	Art and Poetry
	11:30	Wrap-up
	Free time and End of Project CONE	

Results. The parents of these children were overwhelmingly extravagant in their praise of the staff and Project CONE and to a person stated that they hoped that Project CONE would be repeated again next summer. Comments provided at this time included:

> You know, its really nice to attend a workshop that is for the family. Most of these things are only for the children while we parents stand around for a couple of hours and are bored.

and

> I think that if the others had only known what this was they would have been here.

In October, approximately two months later a two page questionnaire was mailed to each of the participating families. Both of the participating families responded to this questionnaire. In addition, one family sent a letter to the Minnesota M.D. Association with their reactions to Project CONE.

Conclusions

There can be no doubt as to the success of Project CONE, as the results clearly speak for themselves. Thee weather cooperated fully and the blueberries were ripe for picking. And while some minor problems did appear, they were easily overcome.

It must be admitted that at least one factor in the overwhelming success of Project CONE, was its small size which enabled the staff to give individual attention to each member of the Project. But another factor in its success lies with the wholehearted commitment of the U.S. Forest Service. The Forest Service not only waived its usual camping fee, but provided around the clock Ranger service, something that is not usually done.

Because of its success, Project CONE was reoffered during the summer of 1984. The results of this second offering were similar to the preceding summer but differed in that only one family appeared this time although there were 4 families which did not show.

NOTE

1. Dennis A. Vinton, editor. March 1983. A Facilitator Guide Lexington: University of Kentucky, Outdoor Education for the Handicapped Project.

VII. FFF. Fee-Oriented Programming: One Method Toward a Sustainable Future

Jann Young, Louis Robidoux Nature Center, Riverside CA, and Christopher Gillem, Oak Canyon Nature Center, Anaheim, CA.

Within the past fifteen years there has been a shift in how environmental education programs and interpretive facilities have been viewed by those holding the "purse strings." The days when we could offer programs and services solely for their community enhancement, consciousness-raising or ethic-instilling betterment of mankind without serious need to be concerned for funding are gone.

Irregardless of how your facility seeks support, we are all accountable to agency administrations, boards of directors, advisory commissions, etc. for our existence. For many the viability of your facility is seen by administrators in either numbers of people serviced, or number of revenue dollars generated, thus justifying your existence.

The goals of this session are three-fold: to present the concept of marketing in the context of environmental education; to provide some tested and proven techniques in marketing revenue-generating programs that may be useful to session participants; and to encourage participants to implement these ideas in their own organization.

It is important to keep several things in mind before developing or increasing revenue programs at your facility. One, you must weigh the ethical, political and practical aspects of fee-based programming based on your agencies' philosophy. Second, revenue generating programs are only one method toward a sustainable future, and it is important to have a balanced combination for long-term broad-based sustainable support. Third, this session focuses on service/products rather than merchandise/products, although many principles are the same.

A strong sense of "organization self" is a very important predecessor to marketing your programs. In looking at fee-based programs, one needs to look into the mirror clearly and concisely assess the organization, its strengths, weaknesses, goals and objectives, available resources and direction. It is very important to maintain the integrity of your facility/agency goals when developing programs because it limits competition and preserves your uniqueness in the public's mind. Examine your niche:

1. Who am I?
    a. Choose three descriptive words that capture the essence of your group.

    b. List three accomplishments of your organization and use numbers - quantify.

2. To whom am I these things?
    a. What do I have of value?
    b. Who needs/wants these things I have or could have?
    c. Work with the other person's needs/wants rather than your own. Concentrate on what they want to buy rather than on what you would like to sell them.

Now, you have assessed who you are and where you are going, but... how do you get there?

The term "marketing" is often confused with promotion, advertising and many other activities which are components of marketing. John Cromption, from Texas A & M, defines marketing as "...the analysis, planning, implementation and control of carefully formulated programs designed to bring about voluntary exchanges with target markets for the purpose of achieving agency objectives. It relies heavily upon designing offerings consistent with client wants, and on using effective pricing, communication and distribution to inform, motivate and service the markets." Frank Benest, a marketing consultant, defines marketing as "a set of activities aimed at effecting an exchange with clients or customers. Marketing involves developing services which are consistent with client needs, and pricing, promoting and distributing these products effectively." In short, marketing is finding a need and filling it.

Now that we have defined marketing, let's look closer at the entire process via a marketing spiral. We have already discussed the need to assess the organization which will provide goals and objectives, and focus for your marketing efforts. In the Marketing Analysis portion of the spiral, assessing user or potential user needs can sometimes be a stumbling block but there are a number of methods available to gain sought information including surveys and questionnaires, personal contacts with clients, researching the demographics of your community, local media, business section of the newspaper, periodicals and research.

The Strategy Development portion of the spiral must first consider the selection of client group. It helps to segment the market, in order to understand the needs/wants of the individual. Target clientele information would include age, income, sex, education, occupation, ethnicity, and other information. A specific market segment "single working fathers with children at home" would be considered a specific target clientele. The next step in the marketing spiral is the design of the program. The program or service (product) development concept will surface as target clientele needs become clear.

Product or program development is an evolving process.

When determining pricing one should consider the following: (1) Know your audience; (2) Survey the competition, including their programs, length/duration, staff structure, instructor fees and attendance; (3) Determine costs, direct and indirect, and give it an hourly cost value or cost per participant value. Direct costs include salaries, brochure production and mailing (or other promotion), program materials (including equipment rentals, etc.) and data processing. Indirect costs include things such as support staff, building/grounds maintenance, insurance, utilities, and resources.

Fees should at least meet (and ideally exceed) your direct costs. Fee establishment is a very individual thing due to local demographics, and requires some "trial and error" experimentation based on a program's past track record. Don't forget the psychology of pricing; you can price a program so low no one will think it worthwhile; increase it slightly and it becomes a bargain the public doesn't think it can pass up. You can then further increase it to the point where the program is simply a time for you to meditate--alone! For new programs or those lightly attended in the past you may want to consider offering discounts. Various types of discounts could include: family, repeat attendance, early registration, or sponsorships. It is important to "contain your enthusiasm" when offering discounts or your clientele will come to expect them.

Distribution refers to the "when and where" you are going to provide the service. "When" includes site considerations, convenience, competition, and travel time (the latter being a very important factor sometimes overlooked.)

If the market has been segmented properly, if the product is priced well, if the location and time are convenient, and the service is designed to meet the needs of your target clientele, your promotion becomes a process of communication rather than hard-sell. The purpose of communication is to help members of the target population become aware of the existing or newly developed program and how the program can meet their needs if they participate. There are many methods to communicate your programs, including personal contact, advertising, free publicity and direct mail marketing.

In the Implementation portion of the spiral it is critical to plan ahead. Develop programs for one entire year or more, based on a fiscal year cycle. This helps to justify your annual budget and allows one to plan properly, obtaining a balanced program schedule.

Once you have programs (or time-segments selected for programs) identified, it is necessary to complete staffing strategies. Sources of staff (depending on what your organization will allow), could include credentialed teachers (pre-school, elementary, high school, and college), community organization people (Scouts, Sierra Club members, etc.), high school students (under Federally funded Summer Young Employment programs), interns, cooperating association members, outdoor schools personnel, volunteers, and of course professional naturalists.

These people can be hired via a variety of methods, such as part-time or full-time temporary personnel, specific program contracts, or cooperating association funds. When staffing a program determine the program duration (hours per day and overall length) then determine staff planning time, contact hours, orientation and evaluation time.

The Marketing Feedback portion of the spiral is a process by which one quantitatively and qualitatively evaluates the program. A variety of techniques are useful in monitoring program success, including written evaluations, exit polls, and personal contacts. Effective listening can be the most effective tool to monitor feedback of the program.

The Further Analysis portion of the spiral is the time to review the total picture; the market, the staff, organization goals, program content, revenue, expenses, etc. Put everything into one place, sort it and analyze.

The final step in analysis is to decide to "scrap it" if the program truly isn't working no matter what you try, or "retreat and regroup," developing a new set of strategies based on your findings.

Environmental education is a process of teaching, caring and understanding. In order to become more effective Environmental Education professionals, one must seek the tools of business and use them to become a more efficient successful entity. Using the marketing approach toward environmental education programming will lead the profession toward a sustainable future.

VII. GGG. Audubon Adventures

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Fall 1985 begins the second year of the National Audubon Society's new youth program, Audubon Adventures. Aimed at elementary students, and designed for flexibility, it has proved to be a great success with teachers across the country.